Vol. 94 No. 1

Records of the Zoological Survey of India

A JOURNAL OF INDIAN ZOOLOGY

Zoological Survey of India

RECORDS
OF THE
ZOOLOGICAL SURVEY OF INDIA

VOL. 94 NO. 1

सत्यमेव जयते

Edited by the Director, Zoological Survey of India
1994

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Published : September, 1994

Price : *Inland* : Rs. 150·00
Foreign : £ 8·00 $ 10·00

Printed in India by A. K. Chatterjee at Jnanodaya Press,
55B, Kabi Sukanta Sarani, Calcutta 700 085 and published
by the Director, Zoological Survey of India, Calcutta.

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STUDIES ON VARIATIONS IN AND CONSEQUENT SYSTEMATIC POSITIONS OF VARIOUS INDIAN SPECIES OF *LEPOCREADIOIDES* YAMAGUTI, 1936 (TREMATODA : LEPOCREADIIDAE)*

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INTRODUCTION

The material under study was collected from fish tongue soles (Family Cynoglossidae) from Arabian Sea and Bay of Bengal during various surveys. On detailed study of five populations of *Lepocreadioides* specimens and review of literature on this genus it was felt that intra-specific variations occur due to morphological changes during development from immature to young adults, to full maturity and to aged states. Species have been described based on all such states of development from Indian region under two genera. Consequently, all such species are considered to be one and the same.

Yamaguti (1936) erected the genus *Lepocreadioides* with *L. zebrini* as type species described from a soleid fish *Zebrias zebrinus* (Temm. *et* Schleg.) from East China Seas and the Sea of Japan. The genus is mainly characterised by the marginal position of the genital pore on left side and near oral sucker. The type species is marked by slight crenulations on the margins of hindbody, a median notch at posterior end, a large pharynx, quite wide caeca terminating close to each other at posterior end of body, a club-shaped cirrus sac restricted to left side of oral sucker and pharynx and an oral sucker a little smaller than acetabulum. The second species *L. branchiostegi* was also described by Yamaguti (1938) but from the latilid fish *Branchiostegus japonicus* (Houttuyn) from Hukui Prefecture, Sea of Japan. This species is characterised by rhomboidal or fusiform body shape, uncrenulated body margins, almost equal suckers, the position of ventral sucker being just in front of equatorial level, comparatively small size of pharynx, elongate club-shaped cirrus sac extending obliquely across the left caecum, marked absence of middle notch at posterior end of body, and not as wide caeca as in the type species. The third species *L. orientalis* was described by Park (1939) from a soleid fish *Areliscus joyneri* (Guner) from Simmi Island, North Tyosen, Korea. It is characterised by leaf-shaped body with slight crenations on lateral body margins and a median incision at posterior end of body, elongated club-shaped cirrus sac, and narrow caeca terminating a little before posterior end of body. Fischthal and Thomas (1970) described another species *L. cynoglossi* from a tongue sole *Cynoglossus goreensis* Steindachner from Cape Coast and Tema in Ghana. It is characterised by inverted bell or pear shape of body with shoulders on each side of oral sucker, absence of body crenations, trifid posterior end, much elongated testes and narrow intestinal caeca.

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* The abstract of the paper was published in the Proceedings of the Third Asian Congress of Parasitology held at Lucknow, 1993.

Five species have been reported from Indian region i.e., from Arabian Sea and Bay of Bengal. They are : *Lepocreadioides indicum* Srivadtava, 1941, in *Platycephalus insidiator* from the coasts of Puri and Karachi ; subsequently reported by Hafeezullah (1970) and Madhavi (1972) in *Cynoglossus* spp. from Arabian Sea and Bay of Bengal ; *Lepocreadioides srivastavai* Gupta and Mehrotra, 1970, in *Cynoglossus cynoglossus* and *Cynoglossus lingua* from Ernakulum coast, Arabian Sea ; *Lepocreadioides* sp. (Fig. 11) of Karyakarte and Yadav (1976), in *Cynoglossus oligolapis* from Ratnagiri coast, Arabian Sea [this species was not named as all the ten specimens were abnormal and immature (due to non-development of eggs)] ; *Bicaudum otolithi* Bilqees, 1971, in *Otolithus argenteus* from Karachi coast, Arabian Sea ; inadequate and erroneous description due to inadequate material ; *Bicaudum interruptum* Bilqees, 1973, in *Cynoglossus sindensis* from Karachi coast, Arabian Sea ; inadequately described due to insufficient material. Gupta and Govind (1984) described *Lepocreadioides thapari* from the fish *Cynoglossus lida* from Puri coast. It has deeply crenated lateral margins but posterior median incision is lacking. It appears to be a variant of *L. srivastavai* or *L. indicus.*

Qui, Zhang and Li (1987) described the eleventh species *Lepocreadioides huanghuaensis* from a tongue sole *Cynoglossus semilaevis* from Tianjin, China (Bohai Sea). It is characterised by broadly ovate body shape, elongated sausage-like testes, no lateral body crenations and a slight posterior median incision. Pu-qin (1982) described *Lepocreadioides pagrosomi* from the fish *Pagrosomus major* Temmnick and Schlegel from China. It does not fit in the genus *Lepocreadioides* because the genital pore, although marginal on left side, is at level of oesophagus, external seminal vesicle is lacking, ovary is smooth (nonlobate), manner of distribution of vitellaria at caecal ends and very long oesophagus.

SYSTEMATIC ACCOUNT

Family : LEPOCREADIIDAE (Odhner, 1905) Nicoll, 1935

Subfamily : LEPOCREADIINAE Odhner, 1905

Genus **Lepocreadioides** Yamaguti

1936. *Lepocreadioides* Yamuguti, *Studies on helminth fauna of Japan. Part 16. Trematodes of fishes, III.* Published by author : 1.

1971. *Bicaudum* Bilqees, *Pakistan J. Sci.,* 14 (3) : 254.

Lepocreadioides orientalis Park

(Figs. 1-9)

1939. *Lepocreadioides orientalis* Park, *Keizo J. Med.*, 10 : 56.
1941. *Lepocreadioides indicus* Srivastava, *Indian J. Vet. Sci. Anim. Husb.*, 11 (1) : 52.
1970. *Lepocreadiodes srivastavai* Gupta and Mehrotra, *Res. Bull. Panjab Uni.* (*Sci*), 21 (1/2) : 173.
1971. *Bicaudum otolithi* Bilqees, *Pakistan J. Sci.*, 14 (13) : 255.
1984. *Lepocreadioides thapari* Gupta and Govind, *Indian J. Parasit.*, 8 (1) : 45.

Material examined : Hosts – *Cynoglossus macrolepidotus* (Bleeker), *Cynoglossus bilineatus* (Bloch), *Cynoglossus* sp. and *Cynoglossus lida* (Bloch), Tongue soles, (Family Cynoglossidae) ; location—intestine ; localities—karaikal (Pondicherry), Junput (W. Bengal), Kandla Port, Okha (Gujrat) and Bakkhali (W. Bengal) ; no. of specimen—11 + 10 + 1 + 13 + 11 = 46, on 7 slides.

In view of the wide range of morphological variations exhibited from preadult state to young adult to fully mature to more aged specimens, a reapraisal of the diagnosis of the species is necessitated, which is furnished below :

Description : Body foliate, 1·22-2·94 mm long, 0·58-1·44 mm wide, bluntly pointed anteriorly, broadly rounded posteriorly ; lateral margins smooth in preadult stage, slightly crenated in young adults, becoming more crenated to various degrees and fashions with growing age and maturity so much so that body getting distinctly divided into anterior and posterior halves in old or gravid specimens by deep crenation on each side ; similarly, posterior end may be smooth or a shallow median depression appearing in young adults, becoming deeper and narrow incision or wide notch with growing age. Tegument with minute spines in anterior region. Acetabulum in front of equatorial plane, 0·12-0·196 in diameter. Oral sucker subterminal, 0·08-0·13 long, 0·09-0·19 wide, smaller than acetabulum. Prepharynx short ; pharynx usually smaller than or equal to oral sucker ; oesophagus short, narrow ; intestinal caeca normal in width, simple, ending blindly a little in front of posterior end of body.

Genital pore marginal, near oral sucker on left side ; genital atrium shallow to slightly tubular, Testes ovate or elliptical, posteguatorial, asymmetrical, intercaecal, on either side of excretory bladder. Cirrus sac club-shaped with elongate neck, obliquely disposed, extending from genital atrium to right side almost in level with anterior margin of acetabulum, enclosing internal seminal vesicle, pars prostatica surrounded by prostate gland cells, ejaculatory duct and cirrus. External seminal vesicle varying in shape, saccular to tubular, between posterior part of cirrus sac and acetabulum.

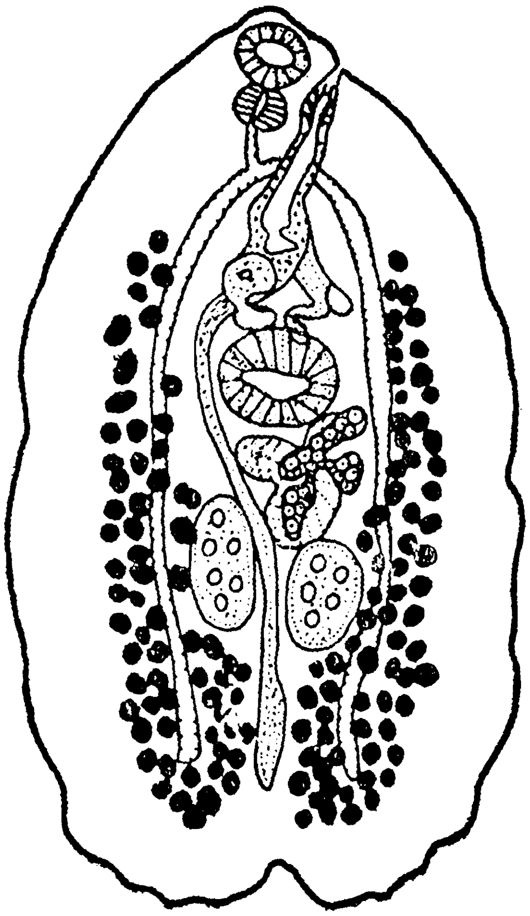

Fig. 1

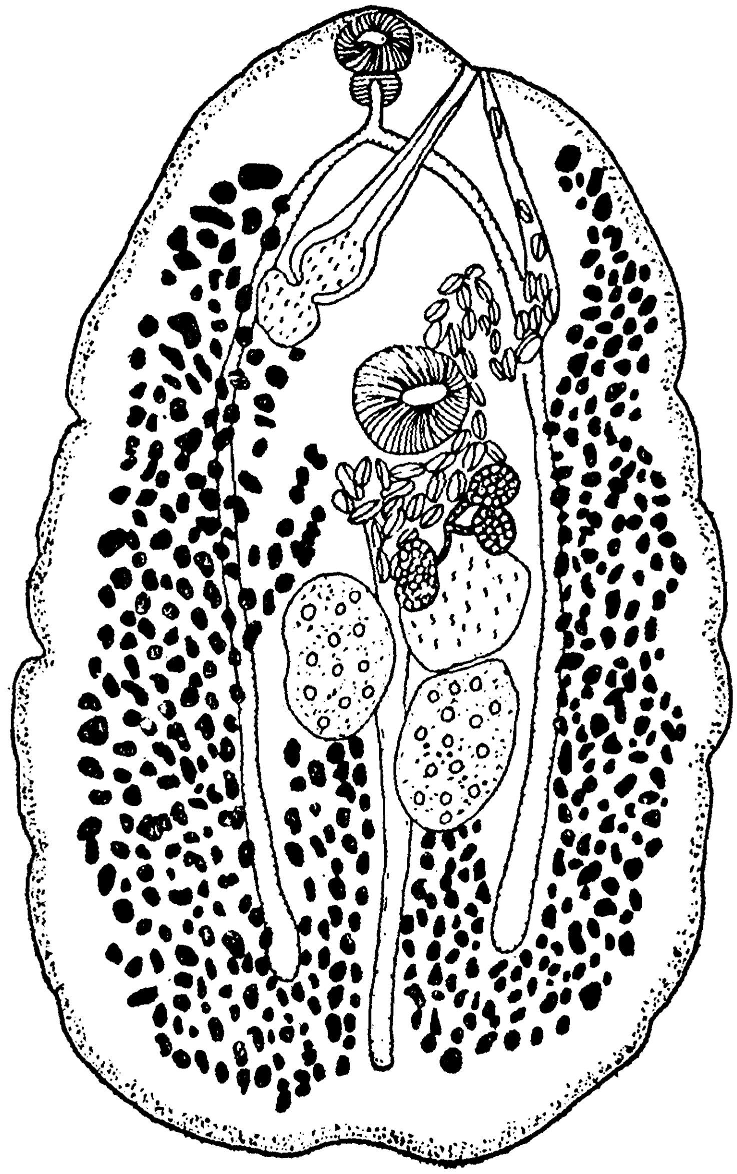

Fig. 2

Fig. 1. *Lepocreadioldes orieutails* Park, 1939 (after Park, 1939).
Fig. 2. *L. orientalis* Park, 1939 (Present material).

Ovary basically 3-lobed, sinistral, in front of posterior testis, lobes joining to knot-like base medially, sublobation occuring occasionally. Uterine coils few, between acetabulum and testes. Metraterm well developed, with associated metratermal gland cells. Seminal receptacle usually dorsal to ovary, position variable. Laurer's canal present. Vitelline follicles lateral along caeca, anterior limit varying between acetabulum and caecal bifurcation, surrounding caeca posteriorly in posttesticular region. Eggs few, 57-68 × 22-34 µm.

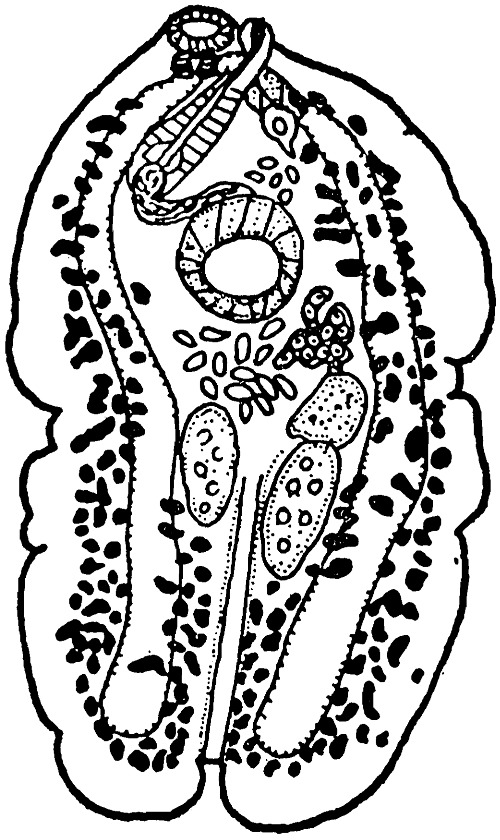

Fig. 3

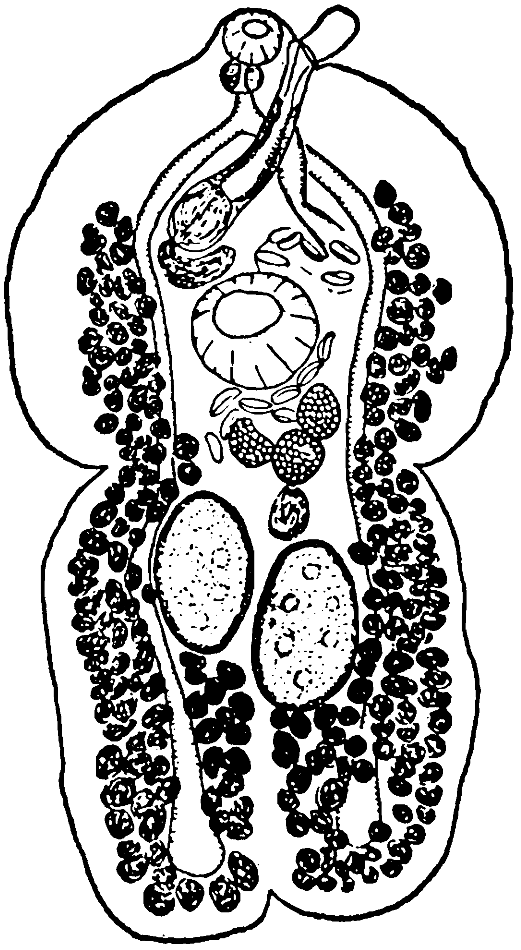

Fig. 4

Fig. 3. *L. indicus* Srivastava, 1941 (after Srivastava, 1941).
Fig. 4. *L. indicus* Srivastava, 1941 (after Hafeezullah, 1970).

Excretory vesicle tubular, extending beyond acetabulum anteriorly ; excretory pore dorsal in rounded or slightly depressed posterior end, usually at tip of incision in fully mature and aged specimens.

Remarks : The genus *Bicaudum* was erected by Bilquees (1971). It was considered as a synonym of *Lepocreadioides* Yamaguti, 1936 by the senior author (in press) and the type species *B. otolithi* Bilqees, 1971 was synonymised with *L. indicus* Srivastava, 1941, thereby accepting the latter as a valid species. But this position is reviewed as a result of the present study putting the validity of Srivastava's species in question.

In an attempt to prepare a key to the species of the genus *Lepocreadioides*, it was quite possible to separate *L. zebrini*, *L. branchiostegi*, *L. orientalis*, *L. cynoglossi*, *L. interruptum*, and *L. huanghuaensis*, but *L. indicum*, *L. srivastavai* and *L. thapari* were difficult to be separated from Park's species in view of the results of the present study.

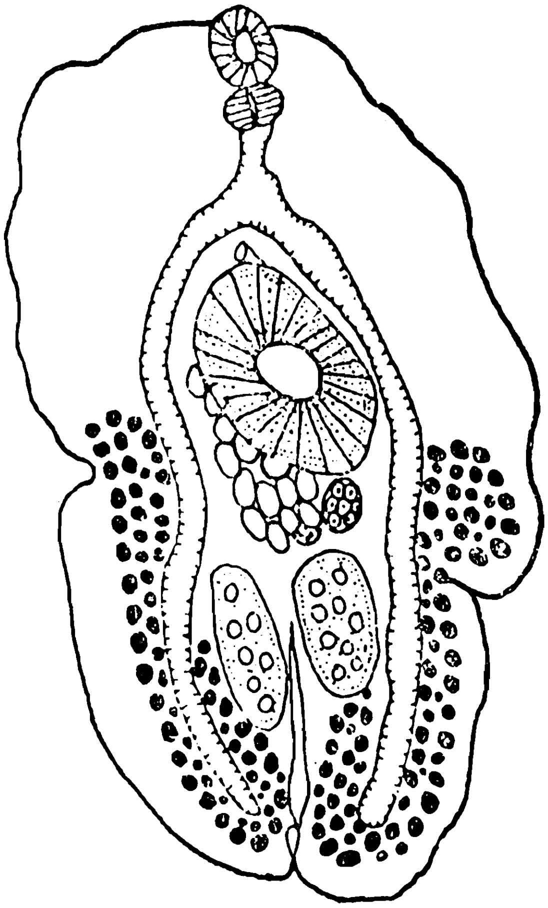
Fig. 5

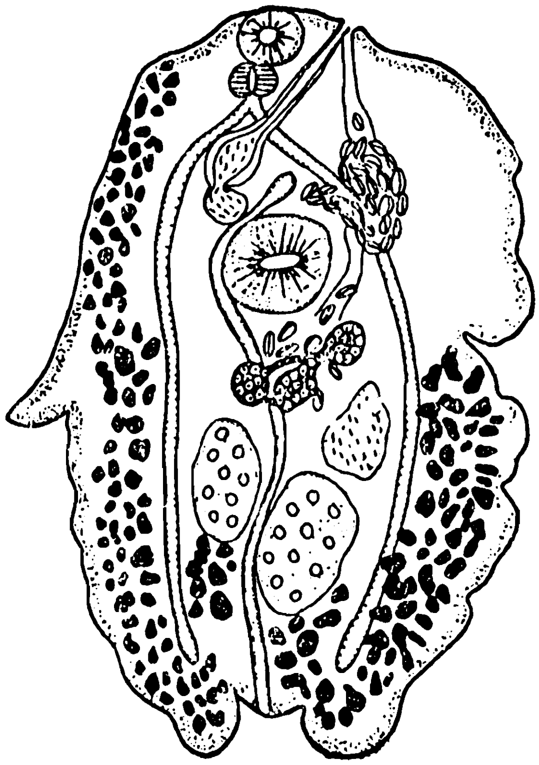
Fig. 6

Fig. 5. *Bicaudum otolthi* Bilqees, 1971 (after, Bilqees, 1971).
Fig. 6. *L. orientalis* Park, 1939 (Present material).

Lepocreadioides sp. of Karyakarte and Yadav (1976) was excluded from considerations as it has been reported from abnormal and immature specimens. *L. interruptum* (Bilqees, 1973) has been tentatively included in the key on the basis of the reported oral sucker smaller than pharynx, interrupted distribution of vitellaria and a wide and deep median notch at posterior end of body.

Lepocreadioides orientalis, *L. indicum*, *L. srivastavai* and *L. thapari* are closely allied species. They resemble each other not only in shape but also in all other morphological characters, except in absence or presence of body spines and posterior median incision, degree and fashion of lateral marginal crenations and posterior median incision, sublobation or not of 3 ovarian lobes as well as size nad posiiton of seminal receptacle. The study of present material consisting of 5 populatious (N = 46) reveals that the body spines are likely to be shed off during processing of specimens. The degree of lateral crenations is associated with maturity and age of the worm. The basic number of ovarian lobes is 3 and their

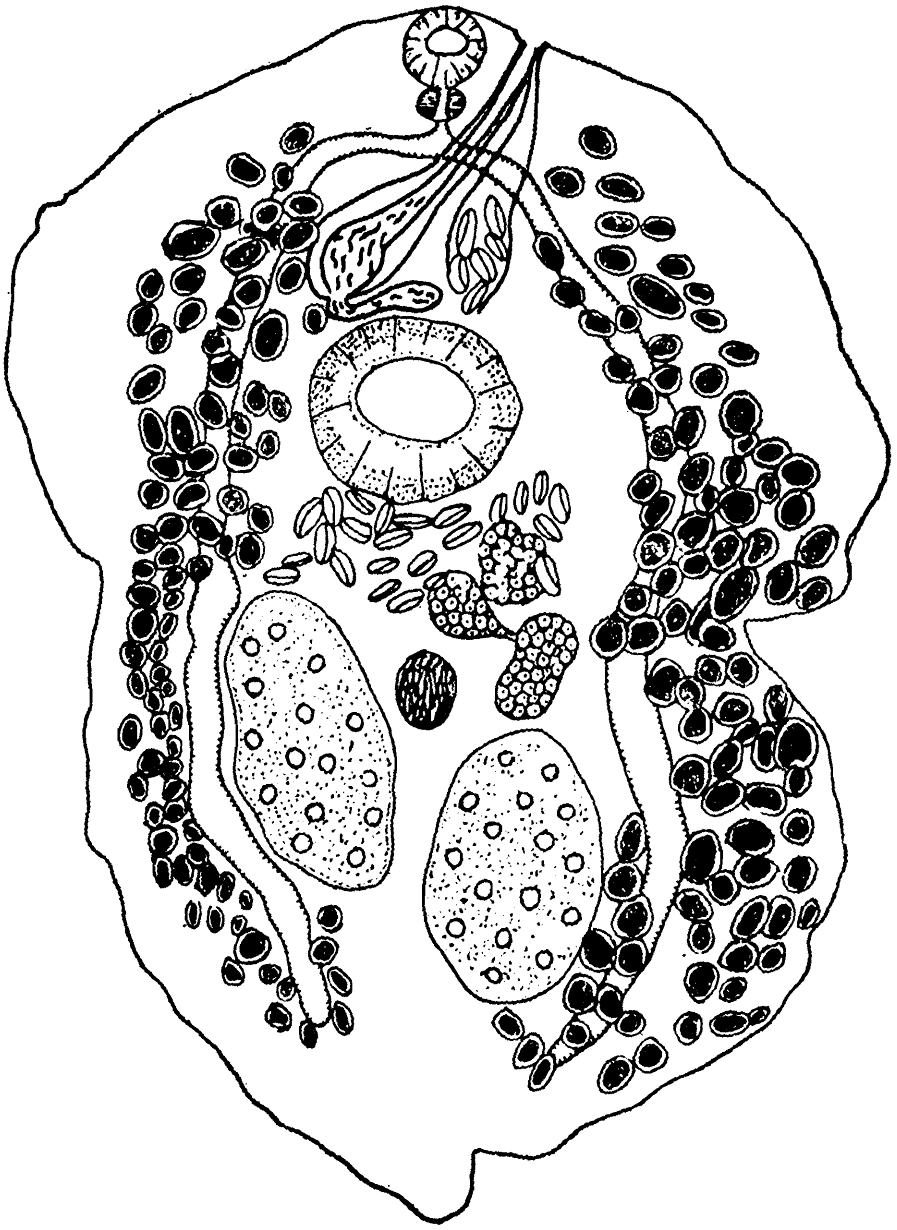

Fig. 7

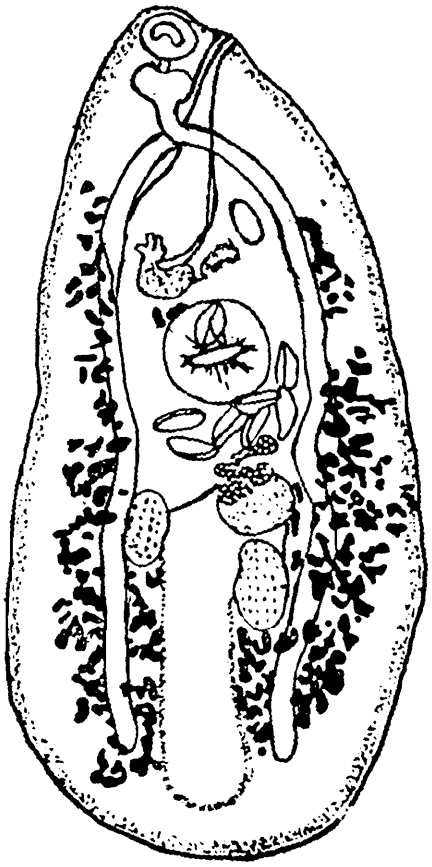

Fig. 8

Fig. 7. *L. orientalis* Pank, 1939 (Present material).
Fig. 8. *L. srivastavai* Gupta and Mehrotra, 1970 (after Gupta and Mehrotra, 1970).

sublobation is not a reliable character to be used for separating species ; the knot-like root where the 3 basic lobes are joined is not to be counted as an ovarian lobe. Seminal receptacle is a transient structure which may vary in size in various specimens of a population. Moreover, it may occupy varying positions near the ovary in permanent mounts.

The present authors have studied several populations of *Lepocreadioides* specimens, including the present five, collected from various species of tongue soles (family Cynoglossidae) both from east and west coasts of India. A population of such specimens may have all fully mature specimens, while another may have all immature or preadult specimens, or the population may have specimens in various stages of maturity and age. Fully mature specimens may have deeply crenated lateral margins and a median incision or notch at the posterior end of body, both characters in varying degrees, while young adults may not show these characters pronouncedly. Variations in other characters may also be found in varying degrees in the specimens of the same population.

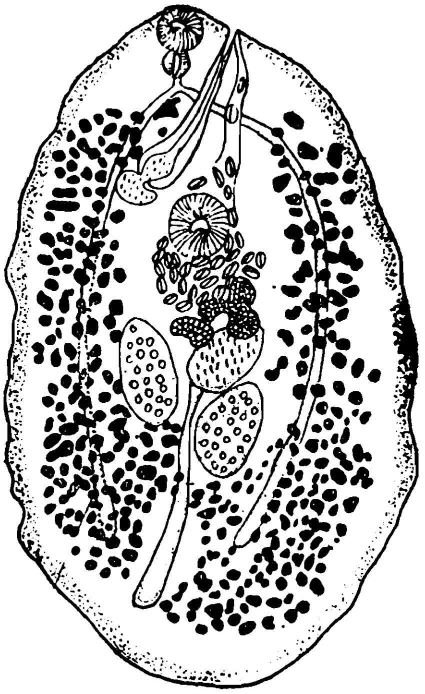

Fig. 9

Fig. 9. *L- orientalis* Park, 1939 (Present material).

Park (1939) described *Lepocreadioides orientalis* from a soleid fish *Areliscus joyneri* (Guner) from Korea on the basis of five specimens. His illustration (Plate VI, fig. 5) shows that the lateral margins are slightly crenated and there is a median incision at the posterior end. Only one or two eggs have been shown in Fig. 5. These features indicate that Park probably had a population of 5 young adult specimens only. Gupta and Mehrotra (1970) described *Lepocreadioides srivastavai* from the tongue soles *Cynoglossus cynoglossus* and *Cynoglossus lingua* from Ernakulum coast on the basis of a population of 3 specimens only. They have noted that the lateral margins are slightly crenated but there is no median incision at the posterior end of body. Srivastava (1941) described *Lepocreadioides indicum* from the fish *Platycephalus insidiator* (family Platycephalidae) and recorded it from the coasts of Puri and Karachi, and subsequently it was reported by Hafeezullah (1970) from *Cynoglossus* spp. (family Cynoglossidae). This species has deeply crenated lateral margins and a deep median incision at the posterior end of body. Hafeezullah's (1970) specimens had deep lateral crenations dividing the body into anterior and posterior regions, as is found in *Bicaudum otolithi* Bilqees, 1971. Karyakarte and Yadav (1976) reported *Lepocreadioides* sp. on the basis of a population of 10 immature specimens which were abnormal as far as the dextral position of genital pore and vertical disposition of cirrus sac are concerned. *L. thapari* occupies an intermediate position between *L. indicum* and *L. srivastavai*.

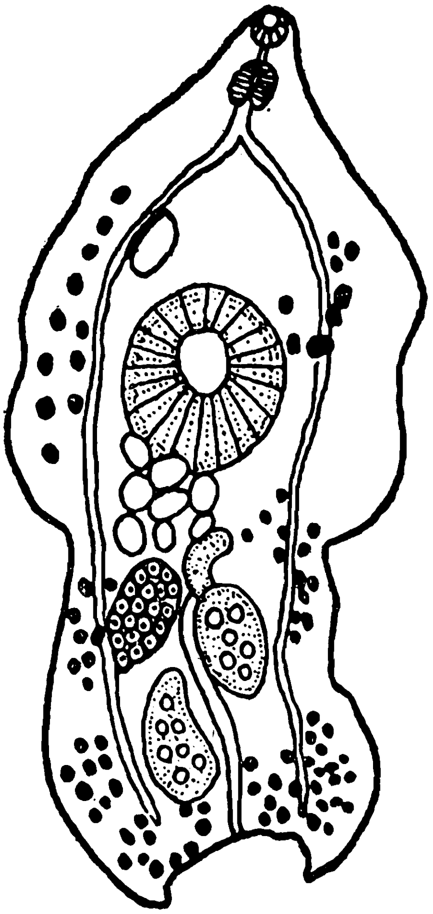

Fig. 10

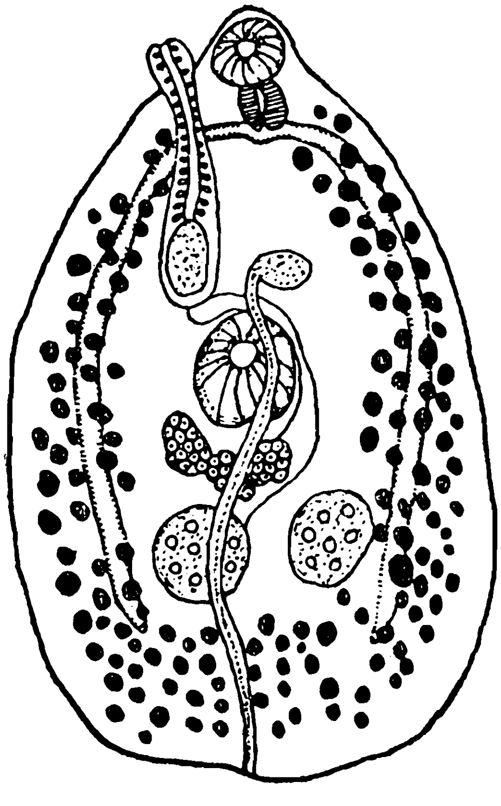

Fig. 11

Fig. 10. *Bicaudum interruptam* Bilqees, 1973 (after Bilqees, 1973).
Fig. 11. *Lepocreadioides* sp. of Karyakarte and Yadav, 1976 (after Karyakarte and Yadav, 1976).

It is also to be noted that *L. indicum* Srivastava, 1941 and *L. srivastavai* Gupta and Mehrotra, 1970 were not compard with *L. orientalis* Park, 1939 when they were described. The Karaikal (11 worms) and Okha (13 worms) populations, consists of specimens which are identical to *L. srivastavai* (Fig. 9), *L. orientalis* (Fig. 2) and *L. indicum*. The single specimen from Kandla Port (Fig. 7) has the body divided into anterior and posterior parts by deep lateral crenations. This specimen is exactly like *Bicaudum otolithi* Bilqees, 1971 (Fig. 5) from Karachi except in complete distribution of vitellaria. Of the Bakkhali population (11 worms), one specimen (Fig. 6) is like the previous one from the Kandla Port with the difference that the vitellaria are restricted to posterior half on the left side while its distribution on the right side is normal and complete. The remaining specimens in this population are identical to *L. srivastavai*, *L. orientalis*, *L. indicum* and *L. thapari*. Of the population from Junput (10 worms), most of them are identical to *L. indicum* while one or two are like *L. srivastavai*, and at least one is like *Bicaudum interruptum* Bilqees, 1973 in shape but with oral sucker larger than pharynx and almost uninterrupted vitellaria.

The above evidences should be adequate enough to indicate that *L. srivastavai*, *L. orientalis*, *L. indicum*, *L. thapari* and *L. otolithi* (Bilqees, 1971) intergrade with each other, each representing early adult, young adult, fully mature adult and pretty old or gravid states in succession of one and the same species. *L. srivastavai* and *L. orientalis* represent two young stages while *L. indicum* and *L. thapari* are fully mature state and *L. otolithi* the gravid condition. Other than variations in degree of lateral body crenations and posterior median incision, there are no pronounced morphological differences in these five species. Consequently, by applying the Law of Priority, *Lepocreadioides orientalis* Park, 1939 emerges as the valid species while *L. srivastavai*, *L. indicum*, *L. thapari* and *L. otolithi* fall as its possible synonyms. It may also be emphesised that in the Bay of Bengal and Arabian Sea the favourite hosts of the genus *Lepocreadioides* Yamaguti, 1936 are the tongue soles (family Cynoglossidae) while *Platycephalus insidiator* (family Platycephalidae) and *Otolithus argenteus* (family Sciaenidae) appear to be accidental hosts. *Lepocreadioides interruptum* (Bilqees, 1973) (Fig. 10) is tentatively considered as a valid species in having oral sucker smaller than pharynx, interrupted distribution of vitellaria and a wide median notch at the posterior end of body instead of a narrow incision.

Distribution : Korea, India and Pakistan.

Key to species of genus *Lepocreadioides* Yamaguti

1. Oral sucker distinctly smaller than pharynx ; vitellaria interrupted ...*L. interruptum* (Bilqees, 1973)

   Oral sucker larger than or equal to pharynx ; vitellaria continuous... 2

2. Cirrus sac small, restricted to left of oral sucker and pharynx ; intestinal caeca quite wide terminating close to each other at posterior end of body ... *L. zebrini* Yamaguti, 1936

Cirrus sac long, extending to right side posteriorly near acetabulum ; intestinal caeca narrow, not extending up to posterior end of body ... 3

3. Body shape rhomboidal or fusiform ; no median incision at posterior end of body ...*L. branchiostegi* Yamaguti, 1937

Body shape and posterior end otherwise ... 4

4. Body broadly ovate ; testes elongated sausage-like ...*L huanghuaensis* Qui, Zhang and Li, 1987

Body and testes shapes otherwise ... 5

5. Body inverted bell-or pear-shaped with shoulders on either side of oral sucker ; lateral body margins not crenated ; posterior end of body trifid ; testes elongate oval ... *L. cynoglossi* Fischthal and Thomas, 1970

Body leaf-like ; lateral body margins crenated ; median incision at posterior end of body present ; testes ovate ... *L. orientalis* Park, 1939

SUMMARY

The genus *Bicaudum* Bilqees, 1971 is considered as a synonym of *Lepocreadioides* Yamaguti, 1936. On the basis of study of five populations of *Lepocreadioides* specimens from the intestine of *Cynoglossus* spp. from Arabian Sea and Bay of Bengal, it has been discussed at length that possibly *L. srivastavai*, *L. orientalis*, *L. indicus* and *L. otolithi* represent various gradual states of development and maturity of one and the same species in succession. *L. srivastavai* and *L. orientalis* are two youngest states while *L. indicum* is a fully mature stage and *L. otolithi* the gravid condition. Other than variations in degree of lateral body crenations and posterior median incision or notch, there are no pronounced morphological differences in these four species. Thus, on the basis of Law of Priority, *L. srivastavai*, *L. indicum* and *L. otolithi* are considered as possible synonyms of *L. orientalis*.

Lepocreadioides sp. of Karyakarte and Yadav, 1976 is based on immature and abnormal specimens ; so it has been excluded from consideration. *L. interruptum* (Bilqees, 1973), although based on a single specimen and inadequate and a bit erroneous description, is considered as a valid species. A key to the valid species of the genus *Lepocreadioides* is also furnished.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. A. K. Ghosh, Director, Zoological Survey of India, for providing laboratory and library facilities, and to Dr. S. K. Bhattacharya, Additional Director, for taking interest in the present study.

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Rec. zool. Surv. India, 94 (1): 15-19, 1994

THREE NEW *ANTENNOSEIUS* SPECIES (ACARINA : MESOSTIGMATA : ASCIDAE) FROM KUMAON HILLS, UTTAR PRADESH, INDIA

S. K. BHATTACHARYYA

Zoological Survey of India, Calcutta

Prior to the present work only one mite species belonging to the genus *Antennoseius* was described from India (Bhattacharyya, 1972). In the present paper descriptions of three new species are given : *Antennoseius ranikhetensis* sp. nov., *A. garurensis* sp. nov. and *A. deyi* sp. nov.

The type specimens are in the collection of the Zoological Survey of India, Calcutta.

Antennoseius ranikhetensis sp. nov.

Female : Dorsal shield reticulate and completely divided into 2 shields. Anterior dorsal shield 0·310 mm long, 0·286 mm wide, bearing 22 pairs of setae. Setae i2, sl, s2, s3, s5 and zl spur-like and the remaining setae simple (fig. 1). Posterior dorsal shield 0·285 mm long, 0·280 mm wide, with 15 simple setae.

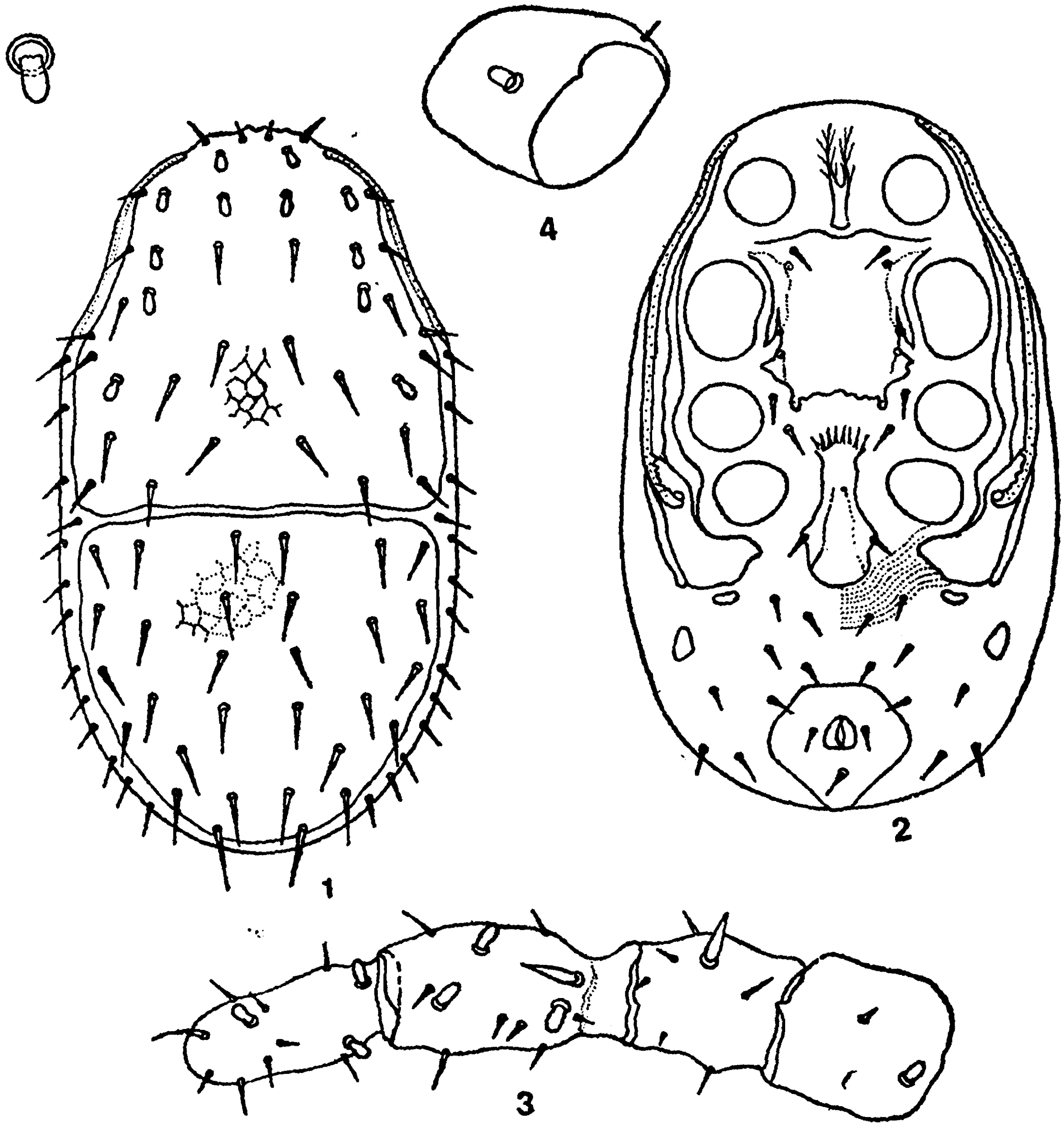
Tritosternum with a basal part and a pair of pilose laciniae. Sternal shield with characteristic shape behind st2 and bearing 2 pairs of setae (fig. 2). Setae st3 lying on interscutal membrane at level of coxa II. Metasternal seta without platelet. Genital shield round posteriorly, with a pair of setae. Anal shield with a pair of par- and a post-anal setae. Stigma level with middle of coxa IV ; peritreme extending beyond coxa I. Peritrematal shield posteriorly curve behind coxa IV and anteriorly fused with dorsal shield. Interscutal membrane behind coxae IV with 8 pairs of setae and 2 pairs of platelets.

Anterior margin of tectum with numerous small spinules. Palpal trochanter, femur and genu of pedipalp with 2, 5 and 6 setae respectively ; apotele 2-tined. Chelicera chelate dentate. Ventrally, gnathosoma with 4 pairs of setae. Corniculus conicle. Lateral margin of hypostomal processes fringed. Eight rows of deutosternal denticles present.

Leg I with ambulacrum and terminally with 4 long setae. Coxa, trochanter, femur and genu of leg I shown in fig. 3. Coxa of leg II as in fig. 4.

Male : Unknown.

Locality : Holotype female, soil under grass, Government Fruit Garden, Chaubatia, Ranikhet, Almora District, U. P., 15.4.71, Dr. S. K. Bhattacharyya.



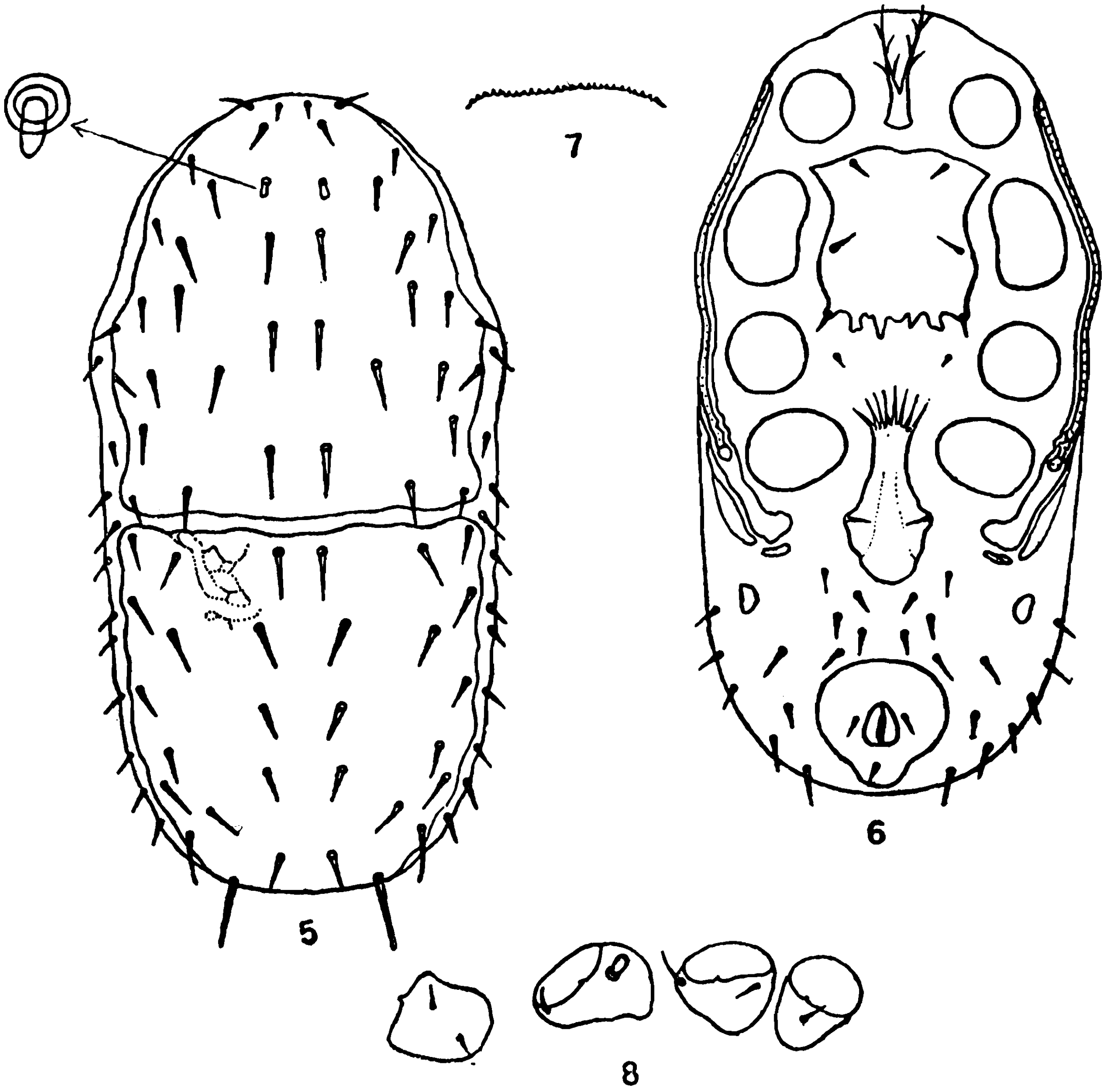
Figs. 1-4 : *Antennoseius ranikhetensis* sp. nov.
Female : 1. Dorsum ; 2. Venter ; 3. Coxa, trochanter, femur and genu of leg I ; 4. Coxa of leg II.

Remarks : This species is unique in having x pairs of spur like setae on the anterior dorsal shield.

Antennoseius garurensis sp. nov.

Female : Dorsal shield reticulate and completely divided into 2 shields. Anterior dorsal shield 0·324 mm long, 0·288 mm wide, with 20 pairs of setae, setae i2 spur-like and the remaining setae simple. Posterior dorsal shield 0·279 mm long, 0·270 mm wide, with 15 pairs of simple setae (fig. 5).

Tritosternum with a basal part and a pair of pilose laciniae. Sternal shield faintly reticulate, posterior margin with characteristic shape, with 3 pairs of setae (fig. 6). Metasternal seta lying on interscutal membrane. Genital shield reticulate, with genital setae. Anal shield pear-shaped, reticulate, bearing a pair of par- and a post-anal setae. Stigma level at middle of coxa IV ; peritreme extending to coxa I. Peritrematal shield posteriorly curve



Figs. 5-8 : *Antennoseius garurensis* sp. nov.
Female : 5. Dorsum ; 6. Venter ; 7. Tectum ; 8. Coxae of legs I-IV.

behind coxa IV and anteriorly coalesced with dorsal shield. Interscutal membrane 2 pairs of platelets and 13 pairs of setae.

Anterior margin of tectum basically with numerous small spinules (fig. 7). Palpal trochanter, femur and genu of pedipalp with 2, 5 and 6 setae respectively ; apotele 2-tined. Ventral groove of gnathosoma with 8 rows of deutosternal denticles. Setae hy p. 1 longest.

Leg I with pulvillus.

Distinctive features of coxae I-IV as in fig. 8.

Male : Unknown.

Locality : Holotype female, soil under grass, Garur, Almora Dist., U. P., 25.4.71, Dr. S. K. Bhattacharyya.

Remarks : This new species differs from all other known species by the presence of one pair of spur-like setae on the anterior dorsal shield.

Antennoseius deyi sp. nov.

Female : Dorsal shield reticulate and completely divided into 2 shields. Anterior dorsal shield 0·290-0·320 mm long, 0·285-0·310 mm wide, with 19 setae. Setae i2 and i3 spur-like, setae r1 pilose and remaining setae simple (fig. 9). Posterior dorsal shield 0·250-0·285 mm long, 0·275-0·315 mm wide, with 15 pairs of setae of which 5 pairs being pilose.

Tritosternum with a basal part and a pair of pilose laciniae. Sternal shield with characteristic shape and bearing 3 pairs of setae (fig. 10). Metasternal seta lying on interscutal membrane. Genital shield round posteriorly, with a pair of setae. Anal shield with a notch at level of post-anal seta, with 3 setae. Stigma level at middle of coxae IV ; peritreme extending beyond coxa I. Peritrematal shield posteriorly curve behind coxa IV and anteriorly fused with dorsal shield. Interscutal membrane behind coxae IV with 2 pairs of platelets and 17 pairs of setae.

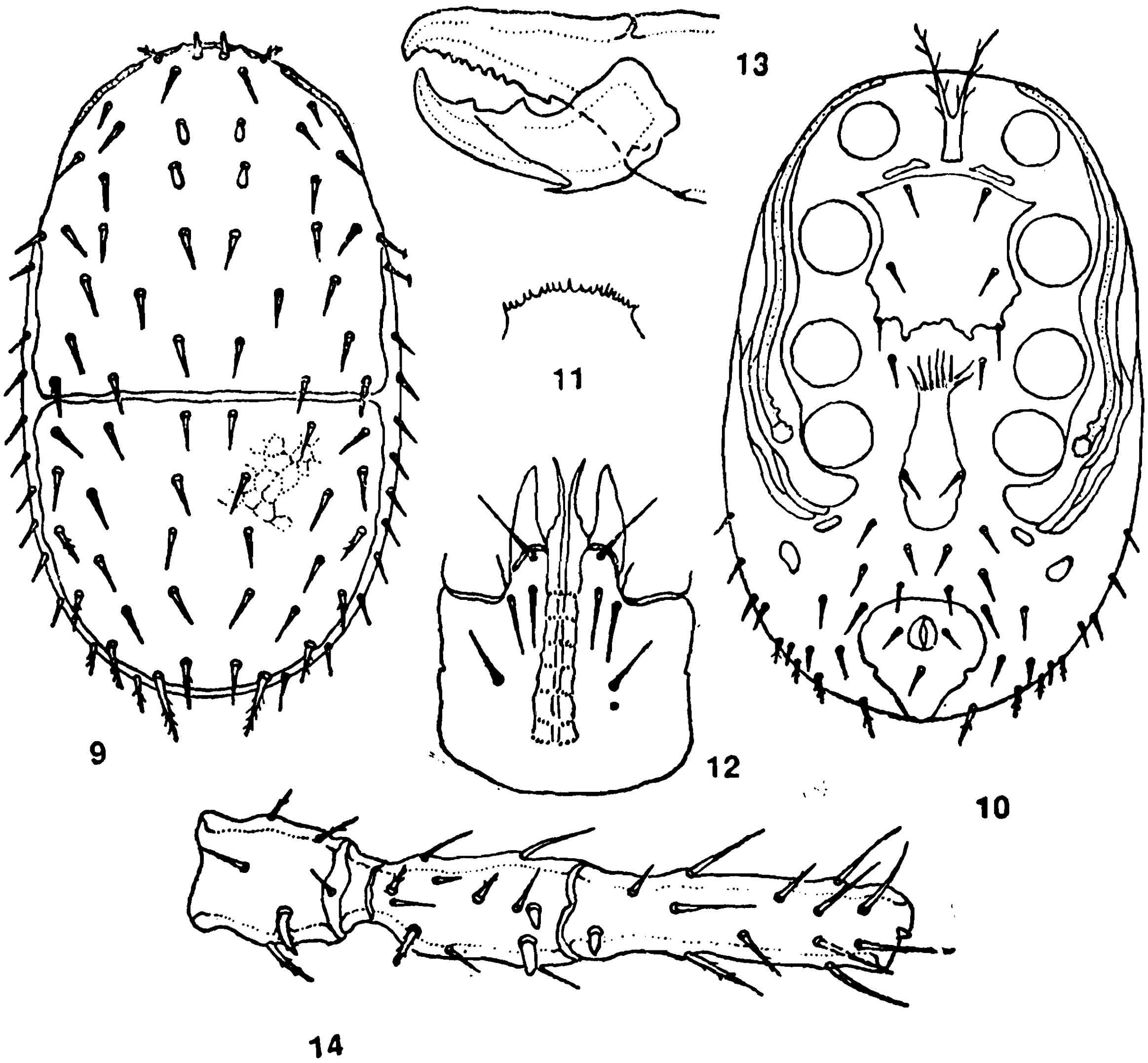
Tectum as in fig. 11. Palpal trochanter, femur and genu of pedipalp with 2, 5 and 6 setae respectively ; apotele 2-tined. Chelicera as in fig. 13. Gnathosoma delineated in fig. 12.

Leg I with ambulactum. Distinctive features of trochanter, femur and genu of leg I as in fig. 14.

Male : Unknown.

Locality : Holotype female, under moss, Madhachar, Kausani, Almora Dist., U. P., 25.4.71. One female paratype, from moss and grass, Ayarpata, Nainital Dist., U. P., 6.4.71, Dr. S. K. Bhattacharyya.

Remarks : This species is distinct from all other known species by the presence of three pairs of spur-like setae on the anterior dorsal shield. This species is named after Shri S. K. Dey who accompanied in the field trip.



Figs. 9-14 : *Antennoseius deyi* sp. nov.
Female : 9. Dorsum ; 10. Venter ; 11. Tectum ; 12. Gnathosoma ; 13. Chelicera ; 14. Trochanter, femur and genu of leg I.

ACKNOWLEDGEMENT

I wish to thank Dr. A. K. Ghosh, Director, Zoological Survey of India, Calcutta, for the facilities.

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Rec. zool. Surv. India, 94 (1) : 21-28, 1994

ON TWO NEW SPECIES OF THE GENUS *CHRISOMON* MANTER AND PRITCHARD, 1961 (TREMATODA : MONORCHIIDAE) FROM INDIA

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INTRODUCTION

Some trematodes were collected from the fish *Eleutheronema tetradactylum* from Digha coast, Bay of Bengal, during the course of faunistic survey. The trematodes collected from the fish *Polynemus paradiseus* at Canning Town, Matla river estuary, Sunderbans, Bay of Bengal, which were donated by Dr. Y. R. Tripathy, Ex-Director, Fisheries, Lucknow, have also been studied. Both the fish hosts belong to the fish family Polynemidae. On study, the trematodes were found to be new to science. It belongs to two new species of the genus *Chrisomon* Manter and Pritchard, 1961, which has so far been reported from the fish family Carangidae from Pacific and Atlantic Oceans falling in Neotropical Zoogeographical Region. The report of this genus now from the fish family Polynemidae and Oriental Zoogeographical Region is interesting

The permanent preparation of the material has been made according to the standard method using borax carmine as stain, clove oil and xylol as clearing agents and Canada balsam as mountant. All the measurements are in millimetres unless otherwise stated. The drawings have been made with the aid of a camera lucida. The material has been deposited with the National Helminthological Collections of Zoological Survey of India, Calcutta.

Family : MONORCHIIDAE Odhner, 1911

Subfamily : LASIOTOCINAE Yamaguti, 1958

Genus **Chrisomon** Manter and Pritchard, 1961

Chrisomon polynemi n. sp.

(Fig. 1)

Host : *Eleutheronema tetradactylum*, (Family POLYNEMIDAE).

Location : Intestine.

Locality : Digha coast, (West Bengal) ; Bay of Bengal.

No. of specimens : Three, on one slide.

Holotype (encircled) and paratypes : ZSI Reg. No. W 7904/1.

Description (based on measurements of three specimens) : Body small, 0·72-0·92 long, 0·14-0·19 wide, more or less spindle-shaped with the part anterior to ventral sucker more distinctly tapering. Tegument spinose. Ventral sucker 0·05-0·08 long, 0·04-0·06 wide, situated at 0·32-0·43 from anterior end of body. Oral sucker subterminal, 0·02-0·03 long, 0·04-0·05 wide, smaller than ventral sucker. Prepharnyx 0·03-0·04 long ; pharynx globular, 0·02-0·03 in diameter ; oesophagus very long, about 0.2, more than three times the total length of prepharynx and pharynx together ; intestinal bifurcation in front of ventral sucker, caeca extending almost up to posterior end of body.

Testis single, elongated, situated near posterior end of body, 0·066-0·09 long, 0·069-0·074 in maximum width. Cirrus sac elongate, extending into vitellarian zone and extending much posterior to ventral sucker, curving around latter anteriorly, containing elongate seminal vesicle, tubular pars prostatica surrounded by prostate gland cells and long cirrus armed with thorn-like spines, opening into genital atrium. Genital atrium large, shallow, median, immediately anterior to ventral sucker ; atrial spines absent.

Ovary 0·082-0·09 long, 0·069-0·072 wide, irregularly lobed, left of median, contiguous with testis anteriorly, not clearly seen due to overcrowding of eggs. Uterus largely between ventral sucker and testis, overlapping latter, not extending posterior to it. Terminal organ or metraterm sac formed posterodorsal to ventral sucker, divided into anterior spinuous part and posterior vesicle. Uterus joining metraterm at junction of two regions of latter. Posterior vesicle of terminal organ with few spines while anterior portion with numerous spines similar to those of cirrus, opening into genital atrium together with cirrus. Uterine seminal receptacle formed, conspicuous behind cirrus sac. Vitelline follicles in ovario-testi-

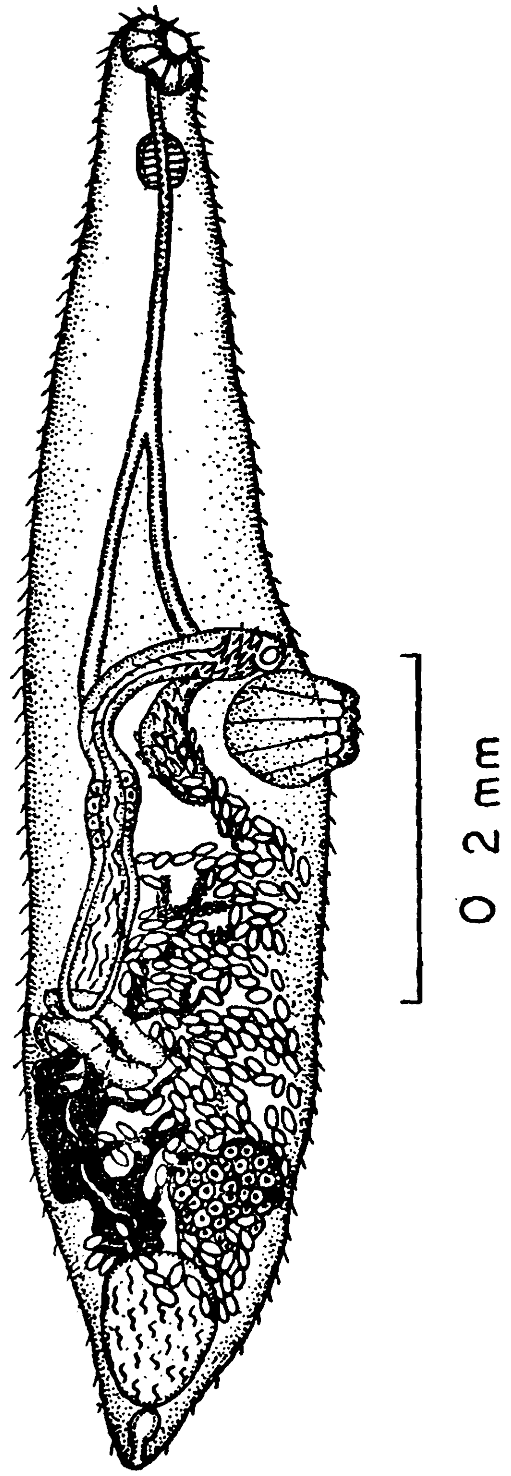

Fig. 1

Fig. 1 : *Chrisomon polynemi* n. sp. Entire Worm. Ventrolateral View.

cular lateral zones, a few follicles tending to fuse together to form simple or branched vitelline tubes. Eggs not filamented, 12-20×8-12 µm. Excretory vesicle saccular; pore terminal.

Discussion: In having postacetabular and largely or entirely pretesticular vitellaria in the ovarian zone, the present specimens belong to the subfamily Lasiotocinae Yamaguti, 1958 of the family Monorchiidae. Further, in having small elongate body, oesophagus more than three times the combined lengths of prepharynx and pharynx, elongate single testis, irregularly lobed pretesticular ovary, bipartite terminal organ (*vide* Nahhas and Cable, 1964; p. 204), cirrus and anterior part of terminal organ armed with similar spines, vitellaria largely in ovarian zone, remaining restricted posterior to ventral sucker, occasionally follicles tending to fuse to form branched tubes, uterus not extending beyond testis posteriorly and unfilamented eggs, the material fits well within the concept of the genus *Chrisomon* Manter and Pritchard, 1961.

So far only two species have been reported in the genus *Chrisomon*. They are: the type species *C. tropicus* (Manter, 1940) Manter and Pritchard, 1961, and *C. decapteri* Nahhas and Cable, 1964. *Chrisomon polynemi* distinctly differs from both the known species in having ventral sucker almost in the equatorial plane, much larger ventral sucker than oral sucker, and much long cirrus sac extending much posterior to posterior extent of metraterm. *C. polynemi* further differs from *C. tropicus* in posterior extent of vitellaria remaining restricted to anterior fringes of testis whereas in *C. tropicus* it extends up to posterior end of caeca overlapping testis sufficiently, posterior part of cirrus sac enters the vitellarian field while in *C. tropicus* it does not, and the testis is broadly wedge-shaped and much shorter whereas in *C. tropicus* it is more or less cylindrical with irregular outline and more than twice longer. In *C. decapteri* the testis is cylindrical, very long, almost half the body length; the ovary is much removed anteriad and overlaps testis anteriorly; the cirrus sac does not enter vitelline field and the vitellaria and uterus both extend into the post testicular zone. In these characters *C. polynemi* is quite distinct from *C. decapteri*.

Chrisomon sunderbanensis n. sp.

(Fig. 2)

Host: *Polynemus paradiseus*, (Family POLYNEMIDAE).

Location: Intestine.

Locality: Canning Town, (West Bengal), Matla river estuary: Sunderbans, Bay of Bengal.

No. of specimens: Four, on one slide, donated to Z. S. I. by Dr. Y. R. Tripathy.

Holotype (encircled) and paratypes : Z. S. I. Reg. No. W 7905/1.

Description (Based on measurements of three specimens) : Body small, 0·75 – 0·81 long, 0·09-0·11 wide, forebody tapering anteriorly, hindbody cylindrical. Tegument

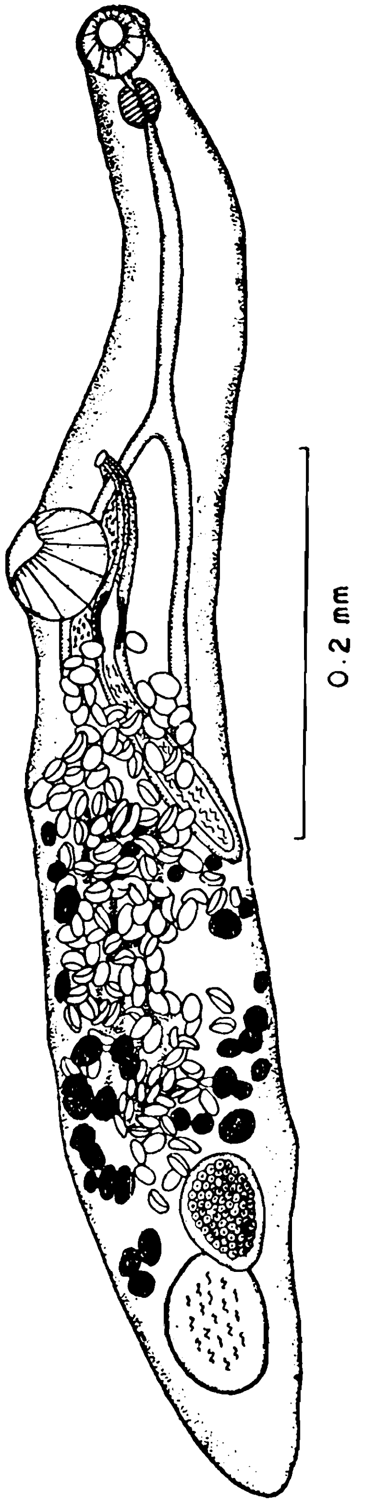

Fig.2

Fig. 2 : *Chrisomon sunderbanensis* n. sp. Entire Worm. Ventrolaterol View.

spinose. Ventral sucker 0·05-0·06 long, 0·04-0·05 wide, preequatorial, situated at 0·28-0·35 from anterior end of body. Oral sucker 0·03-0·04 long, 0·03-0·04 wide, ventroterminal, smaller than ventral sucker. Prepharynx 0·008-0·02 long : pharynx globular, 0·01-0·02 long, 0·02–0·03 wide ; oesophagus very long, 0·15-0·20, about five times longer than prepharynx and pharynx taken together. Intestinal bifurcation in front of ventral sucker. Caeca terminating near posterior end of body.

Testis single, smooth, ovate, situated near posterior end of body, 0·05-0·06 long, 0·03–0·04 wide. Cirrus sac extending into vitellerian zone, elongate, extending much posterior to ventral sucker, curving around it, containing saccular seminal vesicle, pars prostatica surrounded by prostate gland cells and long cirrus armed with thorn-like spines, opening into genital atrium. Genital atrium shallow, immediately preacetabular ; atrial spines absent.

Ovary ovate, smooth, 0·04-0·05 long, 0·02-0·03 wide, pretesticular, overlapping anterior part of testis, slightly left of median. Uterus between ventral sucker and testis ; not descending beyond testis posteriorly. Terminal organ formed, divided into posterior vesicle with very few spines and anterior portion armed with numerous spines similar to those found on cirrus. Uterus joining terminal organ at junction of its two portions. Uterine seminal receptacle formed behind cirrus sac. Vitelline follicles few, on either side of ovario-testicular zone, remaining restricted posterior to cirrus sac, tendency of follicles to fuse not so apparent. Eggs 12-16 × 8-12 µm, unfilamented. Excretory vesicle saccular ; excretory opening terminal.

Discussion : This species closely resembles the previous one and is being reported from an allied species of fish host belonging to the same family Polynemidae. However, it differs from the first species in having the ventral sucker situated more anteriorly from the equatarial plane, the testis is ovate rather than wedge-shaped, the ovary is smooth in outline and overlaps anterior part of testis, and the uterus does not descend up to testis. Further, it differs from *C. tropicus* (Manter, 1940) in the more posterior extent of cirrus sac, smooth ovary (as against irregular in outline) which overlaps the anterior part of testis, ovate (in contrast to elongate and cylindrical) testis, and the uterus not overlapping testis at all. It resembles *C. decapteri* Nahhas ~~and~~ Cable, 1964 in ovary overlapping anterior part of testis only but differs form it in smooth ovary, shape and length of testis, the posterior extent of cirrus sac entering vitellarian zone and vitellaria and uterus not extending in the posttesticular space and the shape of vitelline follicles.

Manter (1940) described *Chrisomon tropicus* (Syn. *Telolecithus tropicus* Manter, 1940) from Panama (Pacific Ocean) from a carangid fish and *C. decapteri* Nahhas and Cable, 1964 was reported from Curacao (West Indies, Atlantic Ocean) from another carangid. These two areas fall in the Neotropical Region. While Manter and Pritchard (1961) proposed the genus *Chrisomon* for *T tropicus*, Nahhas and Cable (1964) emended its diagnosis to accommodate their own species *C. decapteri* in it. Both these species have been reported from the fish family Carangidae. It is interesting to note that another two species of the genus *Chrisomon* occur in an entirely different fish family Polynemidae in an entirely different zoogeographical area, the Oriental Region.

Key to species of the genus *Chrisomon*

1. Testis much elongated, about half the size of body ; uterus and vitellaria extending into posttesticular space ... *C. decapteri* Nahhas and Cable 1964

Testis not that much elongated ; uterus and vitellaria not extending into posttesticular space 2

2. Cirrus sac very long, extending into vitellarian field ; ventral sucker distinctly larger than oral sucker 3

Cirrus sac not that much long, remaining restricted to antero-vitellarian region ; suckers almost equal or slightly subequal ... *C. tropicus* (Manter, 1940)

3. Ovary irregular in outline, contiguous with testis ; ventral sucker immediately in front of equatorial plane ... *C. polynemi* n. sp.

Ovary smooth in outline, overlapping anterior part of testis ; ventral sucker situated more anteriorly from equatorial plane ... *C. sunderbanensis* n. sp.

SUMMARY

Two new species, *Chrisomon polynemi* and *C. sunderbanensis* are described from two polynemid fishes, *Eleutheronema tetradactylnm* and *Polynemus paradiseus* respectively from West Bengal, Bay of Bengal. A key to species of the genus *Chrisomon* Manter and Pritchard, 1961 has also been furnished.

ACKNOWLEDGEMENTS

The authors are obliged to Dr. A. K. Ghosh, Director, Zoological Survey of India, Calcutta, for providing laboratory and library facilities for the present work. They are also thankful to Dr. S. K. Bhattacharya, Additional Director of Z. S. I., for taking interest in it. One of us (B. M.) is thankful to Prof. N. Chatterjee, Head, Ballygunge Science College, Calcutta for allowing him to join in the study. The authors also owe to Dr. Y. R. Tripathy, Ex-Director, Fisheries, Lucknow, U. P., for donating part of the material which forms the basis of the present work.

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Rec. zool. Surv. India, 94(1) : 29-53, 1994

DESCRIPTIONS OF THE GENITALIA OF SOME INDIAN SPECIES OF GENUS *MYLLOCERUS* SCHONHERR, 1826 (COLEOPTERA : CURCULIONIDAE : OTIORRHYNCINAE

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INTRODUCTION

In the present communication, an endeavour has been made to study the male and female genitalia of twenty eight species of genus *Myllocerus* Sch. (Curculionidae : Otiorrhynchinae) from Indian region. An attempt is made to study the taxonomic importance of male and female genitalia at species level.

Myllocerus Schn. is a large and somewhat heterogenous genus represented by about 71 species and subspecies from Indian sub-region alone. Its distribution extends to Africa, Eastern Europe, Central and Southern Asia, and Australia. Many species of the genus are polyphagous pests of forest, agriculture and horticultural plants and are as such of economic importance.

MATERIAL AND TECHNIQUES

Both male and female genitalia were dissected out from the authentically identified specimens present in the collections of Forest Entomology Branch, Forest Research Institute, Dehradun. For preparation of genitalia mounts, method described by Kumar & Sen-Sarma (1974) has been followed. Terminology used for the genitalia is after Lindroth & Palmen (1970) and Spett & Lewitt (1928).

GENERAL DESCRIPTION OF TYPICAL "MALE" AND "FEMALE" GENITALIA OF GENUS *MYLLOCERUS* SCHN.

Male Genitalia (Fig. 1) : Similar to that of tribe Cyphicerinii (Kumar & Sen-Sarma, 1974) ; the general plan is *"annulate type"*. Aedeagus comprises an elongate subcylindrical *penis* (P), with well developed paired *apophyses of penis* (AP. P.) and an *internal sac* (INT. S.) with chitinous *endophallic armature* (END. ARM.). *Basal piece* (B. PC.) of *tagmen* (T.)

forms a complete ring around penis with which it is loosely connected permitting the movement of the latter ; *parameres* completely reduced and can not be distinguished from the weakly chitinized basal piece. Proximally, the basal piece is produced to form a long *manubrium* (MN). Internal sac is tubular and armed with a series of spines, denticles, papillae, etc., forming a well developed and distinct endophallic armature. Pattern of armature is characteristic of each species thus making it a useful taxonomic character at species level. It functions on the "lock and key" principle.

Female genitalia : is *"tubular type"* with well developed *bursa copulatrix* ; spermathecal duct is long and narrow and it opens into the bursa copulatrix. *Spermatheca* is sclerotized and invariably has distinct dorsal arms (the *collum* and *ramus*) ; the *cornu* or bent part of the capsule may be pointed or blunt apically, shape and size of the capsule varies distinctly in different species and provides an important taxonomic character at species level (cf. plate 1). *Bursa copulatrix* is well developed in this genus, it is variable and found to be conspecific in the species studied.

Genus **Myllocerus** Schonherr

Myllocerus Schonherr, 1826, *Disp. Meth.* : 178.

1. **Myllocerus viridanus** (Fabricius, 1775)

(Figs. 1-8)

Curculio vridanus Fabricius, 1775, *Syst. Ent.*, : 155.

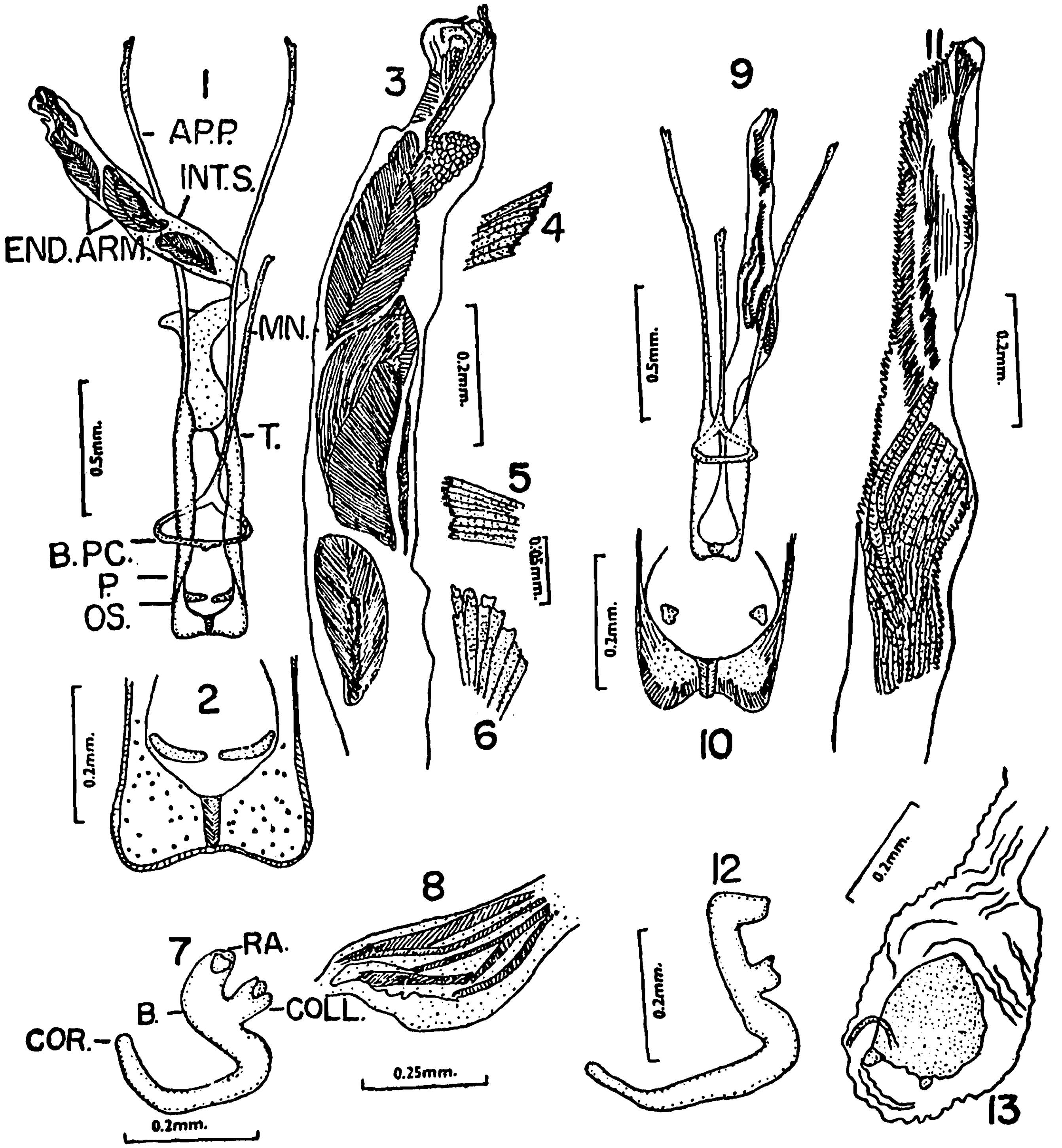
Penis (Fig. 1) subcylindrical, sclerotized and broad framed ; paired apophyses well developed, converging proximally ; distal margin of penis gently curved, chitinized (Fig. 2) ; ostium narrow, long ; tagmen with a ring like basal piece and well developed manubrium ; *endophallus* (Fig. 3) internal sac narrow, cylindrical, *endophallic armature* (Figs. 3-6) in the form of 3 bean-shaped patches of parallely arranged spines, a bunch of papillae present apically. *Spermatheca* (Fig. 7) capsule weakly sclerotized, collum obliquely forward, ramus knob like, blunt at apex, *bursa copulatrix* (Fig. 8) with a series of parallely arranged sclerotized bands.

2. **Myllocerus paetus** Marshall, 1916

(Figs. 9-13)

Myllocerus paetus Marshall, 1916, *Fauna Brit. India, Coleoptera (Rhynchophora : Curculionidae)* : 303.

Penis (Fig. 9) weakly sclerotized, lateral sides almost parallel ; apex gently curved (Fig. 10), ostium well developed ; apophyses weak diverging apically ; internal sac narrow, long ; *endophallic armature* (Fig. 11) in the form of long curved chitinized bands in the basal portion, while a narrow strips of spines present apically. *Spermatheca* (Fig. 12) capsule uniformly sclerotized, cornu long and narrow almost vertically bent ; both collum and ramus transversally bent forming 'F' shape. *Bursa copulatrix* (Fig. 13) flask like, oval with a median chitinous patch.



Figs. 1-13 : *Myllocerus viridanus* (Fabricius) : Aedeagus (dorsal view), 2- opical end of penis, 3- internal sac ; 4- 5- 6- endophallic armature, 7- spermatheca ; 8- bursa copulatrix. *Myllocerus paetus* Marshall : 9- aedeagus, 10- apical end of penis, 11- internal sac, 12- spermatheca, 13- bursa copulatrix.

Aedeagus (Fig. 14) with penis flat and broad diverging laterally at the middle ; apophyses long, gently curved in ; basal piece weak ; manubrium long, thin, well developed, ostium extending beyond apical margin of penis (Fig. 15) ; *Endophallus* (Figs. 14 & 16) narrow cylindrical with 3 pinnate bands of armature situated at a basal, middle and apical portions ; spines arranged like book leaves ; terminating apically into a tendril like projection. *Spermatheca* (Fig. 17) body bulbous, cornu deeply curved over the body, ramus "C" shaped, collum well developed, thumb like. *Bursa copulatrix* (Fig. 18) well developed, club shaped.

4. **Myllocerus delicatulus** Boheman, 1843

(Figs. 19-22)

Myllocerus delicatulus Boheman, Schönh, 1843, *Gen. Curc.*, 7(1) : 6.

Aedeagus (Fig. 19) with robust, subcylindrical penis, substraight laterally, apical margin weakly convex ; ostium medium sized ; apophyses long, narrow, gently diverging apically, basal piece well developed ; *endophallus* (Figs. 19-21) internal sac somewhat narrow apically ; endophallic armature well developed in the apical half, present In the form of two lateral bands of obliquely arranged spines. *Spermatheca* (Fig. 22) tubercular, cornu long, curved and narrow at apex ; ramus with short neck bending obliquely over the body, wedged apically ; collum short and straight.

5. **Myllocerus tenuiclavis** Marshall, 1916

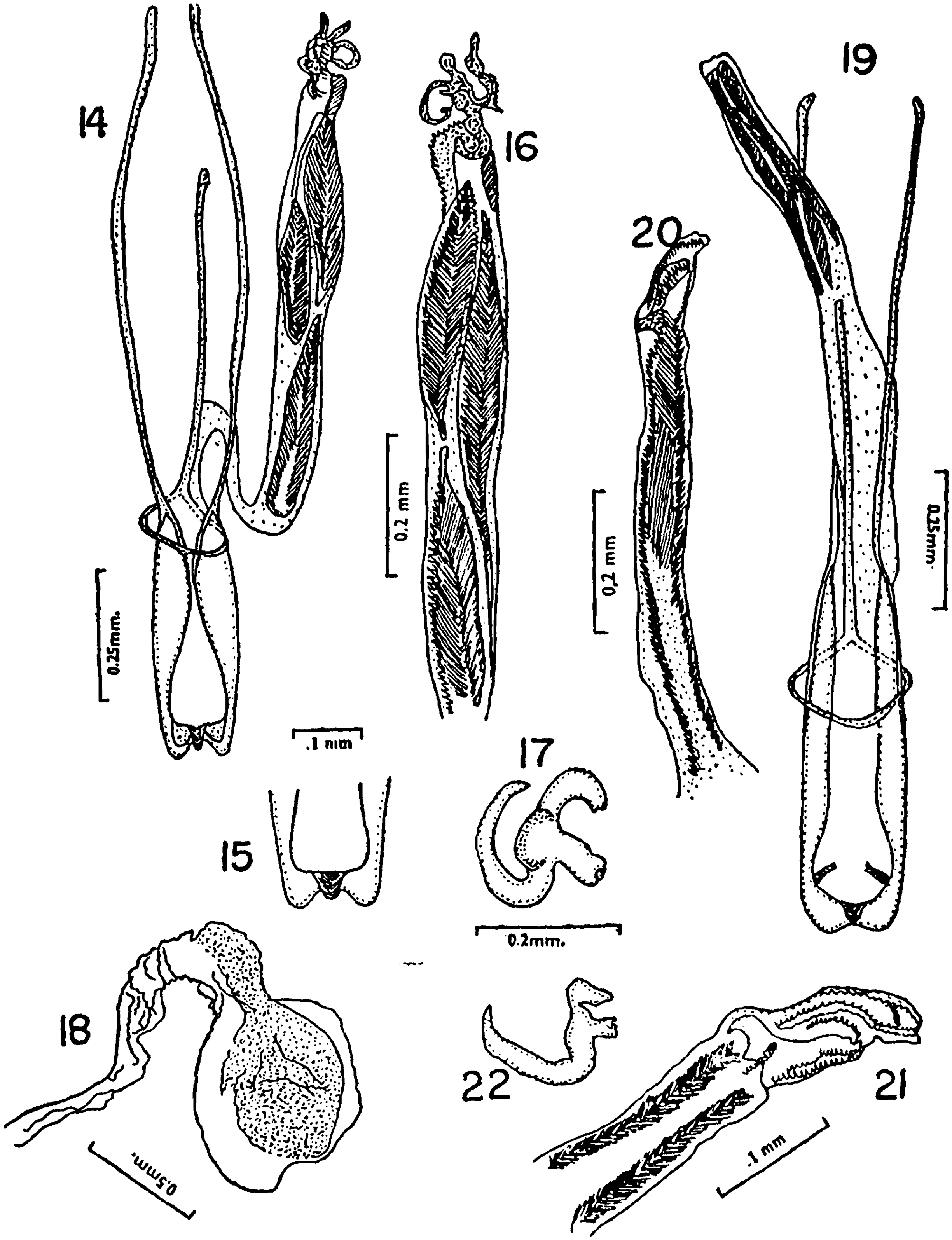
(Figs. 23-26)

Myllocerus tenuiclavis Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhynchophora* : *Curculionidae*) : 327-328.

Aedeagus (Fig. 23) medium sized with narrow elongated internal sac ; penis flattened, apical margin deeply concave ; ostium reduced ; apophyses almost straight ; basal piece weak, manubrium long ; *endophallus* (Figs. 23-25) armature well developed, arranged in the form of two bands of obliquely arranged spines in narrow basal portion, with chitinous dentations in the broad apical half and again in the form of long chitinous spines in the narrow apex. *Spermatheca* (Fig. 26) bulbous, forming a thumb at the base of ramus ; cornu narrow, curved and pointed at apex ; ramus compressed "C" shaped, thrown back a bit, collum medium sized ; knob like, directed upwards.

3. **Myllocerus evasus** Marshall, 1916
(Figs. 14-18)

Myllocerus evasus Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 304.

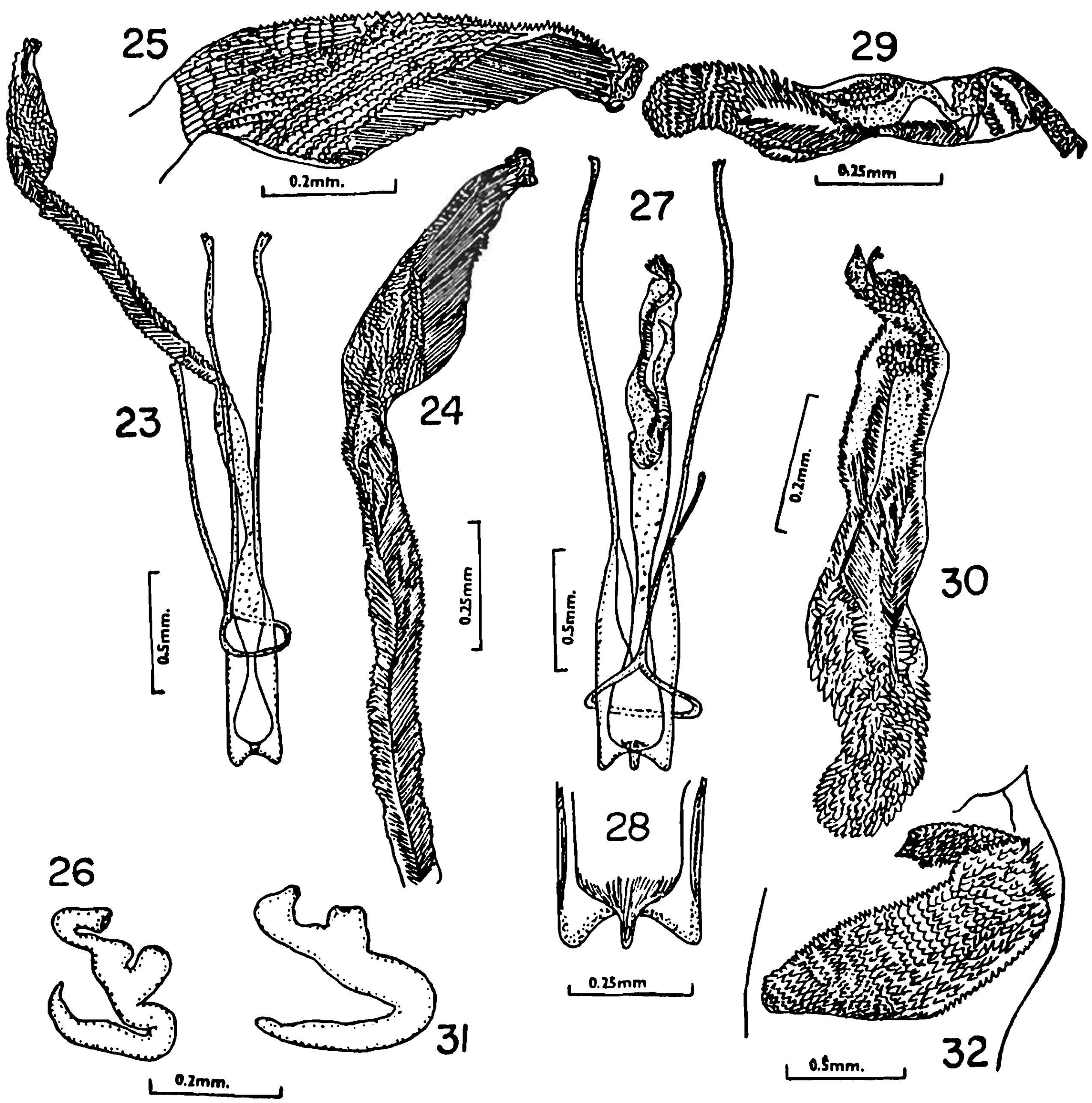


Figs. 14-22 : *Myllocerus evasus* Marshall : 14- aedeagus, 15- distal end penis, 16- internal sac, 17- spermatheca, 18- bursa copulatrix, *Myllocerus delicatulus* Boheman, 19- aedeagus, 20- internal sac, 21- apical half internal sac, 22- spermatheca.

6. **Myllocerus fabricii** Guerin, 1843

(Figs. 27-32)

Myllocerus fabricii Guerin, 1843, *Voy. Deless.*, 2 : 53.



Figs. 23-32 : *Myllocerus tenuiclavis* Marshall : 23- aedeagus, 24- internal sac, 25- endophallic armature, 26- spermatheca, *Myllocerus fabricii* Guerin, 27- Aedeagus, 28- apical end penis, 29- internal sac, 30- endophallic armature, 31- spermatheca, 32- bursa copulatrix.

Aedeagus (Fig. 27) medium sized, apical margin penis deeply curved (Fig. 28), ostium well developed extending beyond its apical margin, opophyses medium sized, arched apically, basal piece large ; manubrium reduced ; *endophallus* (Figs. 29 & 30) internal sac cylindrical sac like and deeply serrated, armature comprising overlapping oblique rows of denticles in basal half, a number of cuticular scales present apically, extremely chitinized. *Spermatheca* (Fig. 31) body large ; ramus beak like ; collum bulbous, cornu long, cylindrical, deeply curved. *Bursa copulatrix* (Fig. 32) large, sac like, with densely arranged rows of overlapping chitinous plates.

7. **Myllocerus laetivirens** Marshall, 1916
(Figs. 33-35)

Myllocerus laetivirens Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 327-328.

Aedeagus (Fig. 33) large but weakly chitinized, penis somewhat flattened, broader, at the base ; ostium reduced ; apophyses long, widely diverging apically, basal piece weak ; *endophallus* (Figs. 33 & 34) internal sac medium sized, armature 'bean' shaped, restricted to proximal half only ; parallely arranged oblique chitinous serrations present. *Spermatheca* (Fig. 35) scelerotized, bulbous and strongly arched apically, ramus short, blunt, collum enlarged and protruding out ; cornu tapering towards apex, angulated.

8. **Myllocerus sabulosus** Marshall, 1916
(Figs. 36-38)

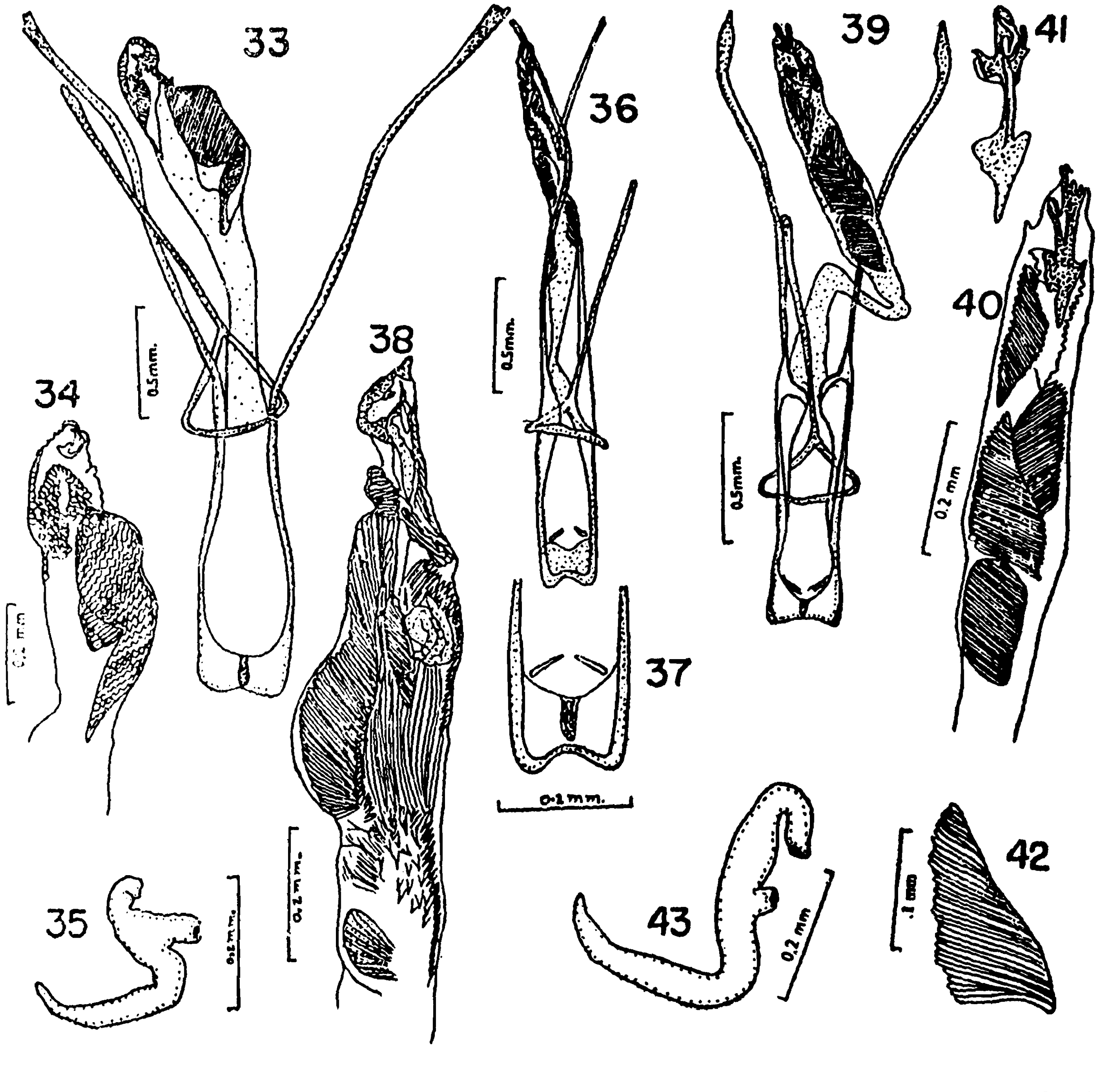
Myllocerus sabulosus Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 336-337.

Aedeagus (Fig. 36) weakly sclerotized, penis small, lateral sides sub-parallel, apical margin moderately curved, ostium weak not extending up to the apical margin, apophyses medium sized, basal piece weak ; *endophallus* (Figs. 36 & 38) internal sac elongate, bulbous in the middle, densely chitinized with a varied armature of spines, plates and papillae (Fig. 38).

9. **Myllocerus transmarinus** (Herbst, 1795)
(Figs. 39-43)

Curculio transmarinus Herbst, 1795, *Kaf.* 6 : 213.

Aedeagus (Fig. 39) well formed, lateral sides of penis converging gently in basal half ; apical margin of penis very slightly curved, subcylindrical ; ostium medium sized ; apophyses medium, distinctly diverging at the apex ; *endophallus* (Figs. 39-42) internal sac large, spindle shaped with a number of apical hooks ; armature comprises 4 bean shaped, chitinous, peripherally arranged bands (Figs. 40), plates arranged obliquely like book leaves (Fig. 42).



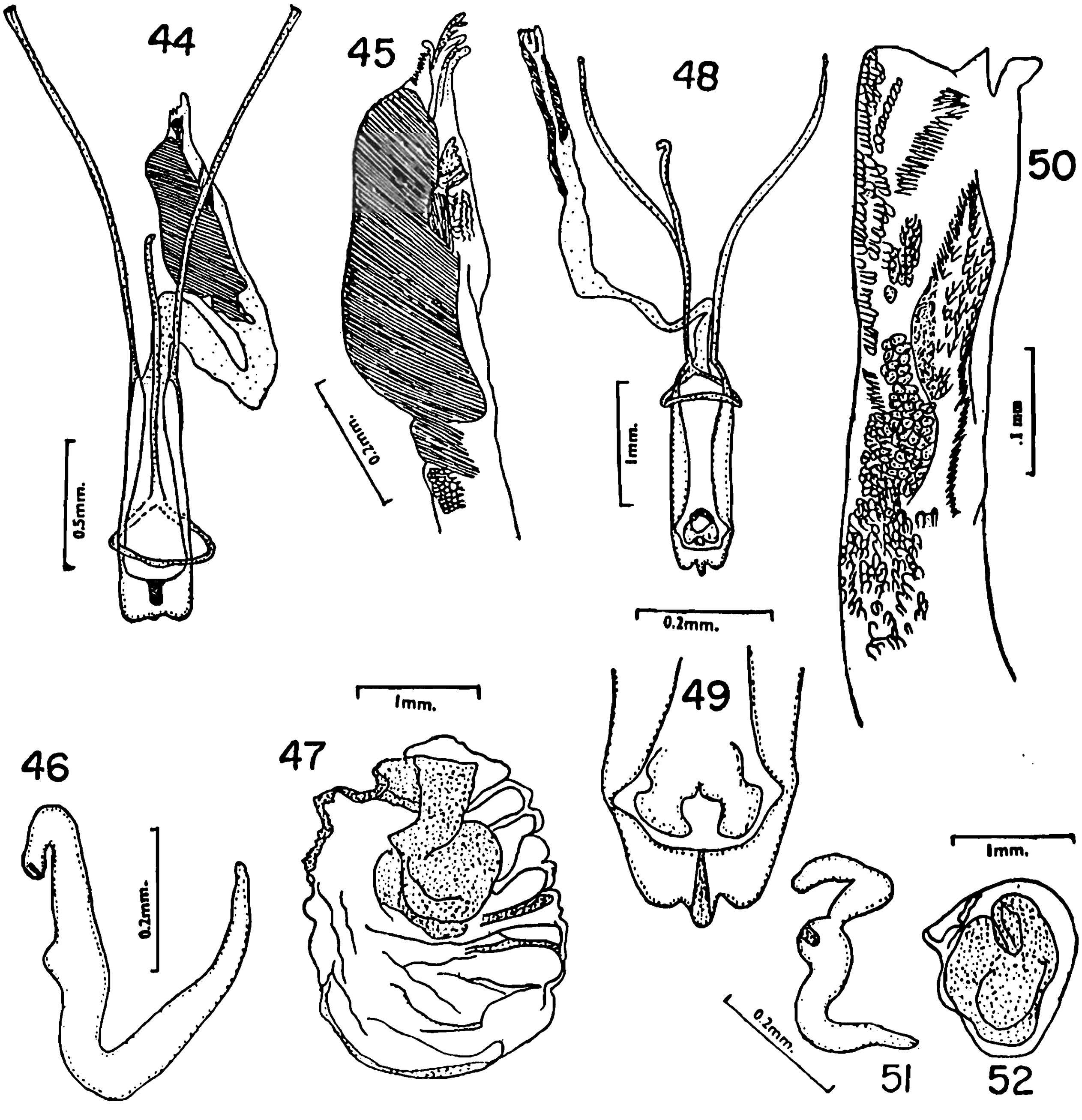
Figs. 33-43 : *Myllocerus laetivirens* Marshall : 33- aedeagus, 34- internal sac, 35- spermatheca. *Myllocerus sabulosus* Marshall, 36- aedeagus, 37- distal end penis, 38- endophallic armature. *Myllocerus transmarinus* (Herbst), 39- aedeagus, 40- endophallic armature, 41- apical end internal sac, 42- armature, 43- spermatheca.

Spermatheca (Fig. 43) large, ramus bulbous, inverted "U" shape ; collum reduced, wart like ; cornu well formed curved almost at right angles.

10. **Myllocerus cardoni** Marshall, 1916
(Figs. 44-47)

Myllocerus cardoni Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhynchophora* : *Curculionidae*) : 339.

Aedeagus (Fig. 44) strongly sclerotized, elongated ; penis moderate, slightly narrow in basal half ; apical margin weakly curved, ostium small not extending up to the apical margin ; opophyses, narrow, long, basal piece medium ; *endophallus* (Figs. 44 & 45) internal



Figs. 44-52 : *Myllocerus cardoni* Marshall : 44- aedeagus, 45- endophallic armature, 46- spermatheca, 47- bursa copulatrix, *Myllocerus lefroyi* Marshall, 48- aedeagus, 49- apical end penis, 50- endophallic armature, 51- spermatheca, 52- bursa copulatrix.

sac large, thickly chitinous ; armature kidney shaped with the chitinous bands arranged in obliquely parallel rows in one patch (Fig. 45), apical margin ending in a number of spines. *Spermatheca* (Fig. 46) ramus apical, inverted "U" shaped ; collum much reduced papillae like ; cornu 'V' shaped, large ; *bursa copulatrix* (Fig. 47) large, oval, laterally convulated, small median funnel shaped sclerotized portion distinct.

11. **Myllocerus lefroyi** Marshall, 1916
(Figs. 48-52)

Myllocerus lefroyi Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 340-341.

Aedeagus (Fig. 48) rather medium, weakly sclerotized, penis dorso-ventrally flattened, apical margin strongly curved, ostium extending up to the end of the median protrusion ; apophyses long, narrow, basal piece medium with rather long manubrium ; ***endophallus*** (Fig. 50) moderately chitinized wiih a number of teeth and papillae present irregularly in lateral bands, apical margin truncated. *Spermatheca* (Fig. 51) ramus well developed finger like pointing forward, thrown back a bit, collum reduced, bulbous like a thumb, at the base of ramus ; cornu reduced curved at almost right angles, pointed apically, ***bursa copulatrix*** (Fig. 52) reduced, almost oval, a bulbous sclerotized patch covering the major area.

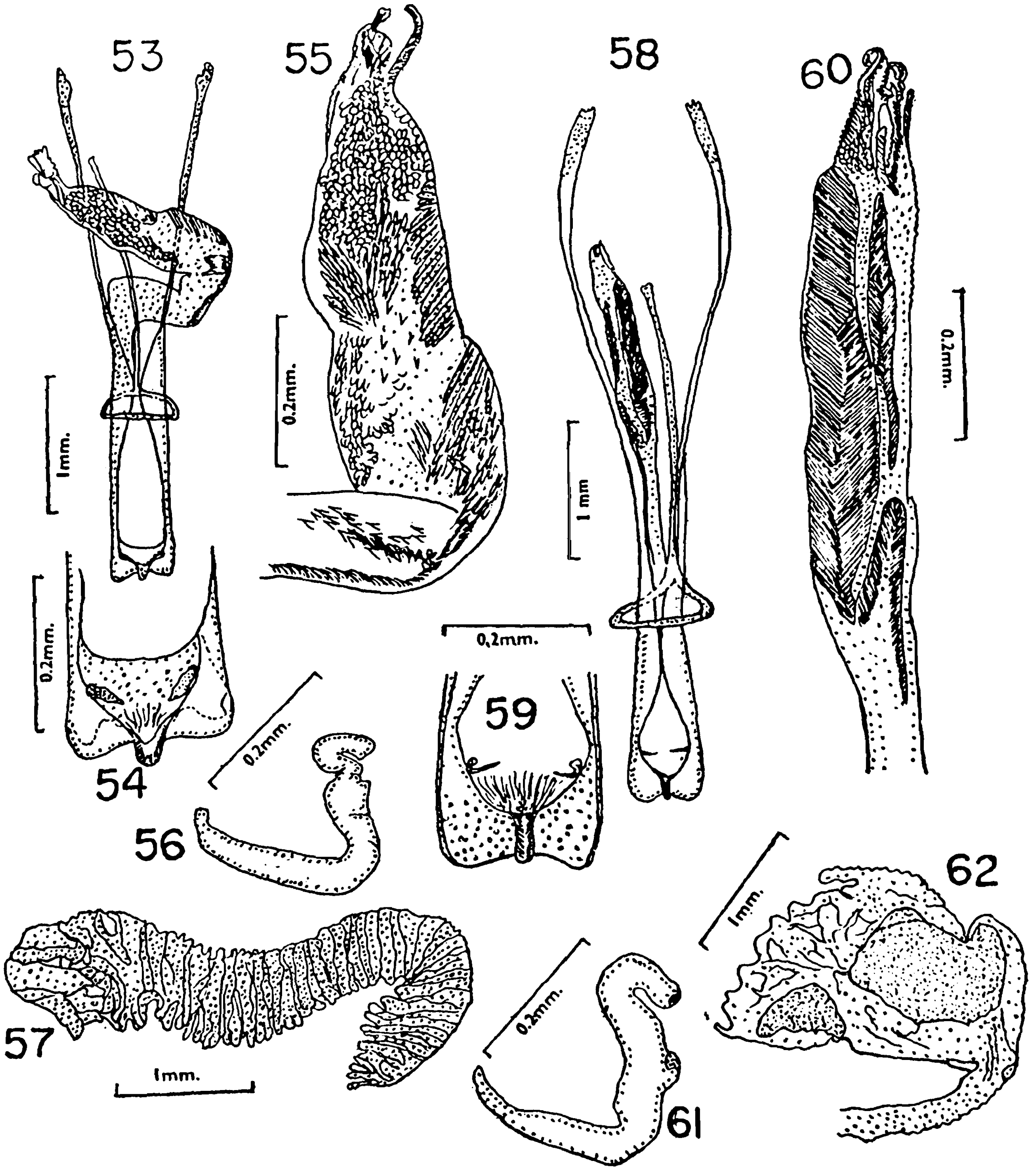
12. **Myllocerus severini** Marshall, 1916
(Figs. 53-57)

Myllocerus severini Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 342

Aedeagus (Fig. 53) medium, moderately sclerotized, penis flattened, laterally sub-parallel, apical margin moderately curved, ostium well developed, extending beyond the apical margin (Fig. 54) ; ***endophallus*** (Fig. 55) internal sac enlarged, almost bell shaped, thickly chitinized with apical papillae and latero-obliquely arranged bands, a number of spines present too ; *spermatheca* (Fig. 56) ramus reduced, like the hook of a hanger, collum rudimentary, cornu moderate almost straight ; *bursa copulatrix* (Fig. 57) cylindrical, elongated, strongly curved at one end, wrinkled bands present throughout its length.

13. **Myllocerus curvicornis** (Fabricius, 1792)
(Figs. 58-62)

Curculio curvicornis Fabricius, 1792, *Ent. syst.*, 1 (2) : 488, *Aedeagus* (Fig. 58) rather large with long apophyses, penis weakly scelerotized, convex apically, apical margin moderately curved, ostium well developed (Fig. 59), apical



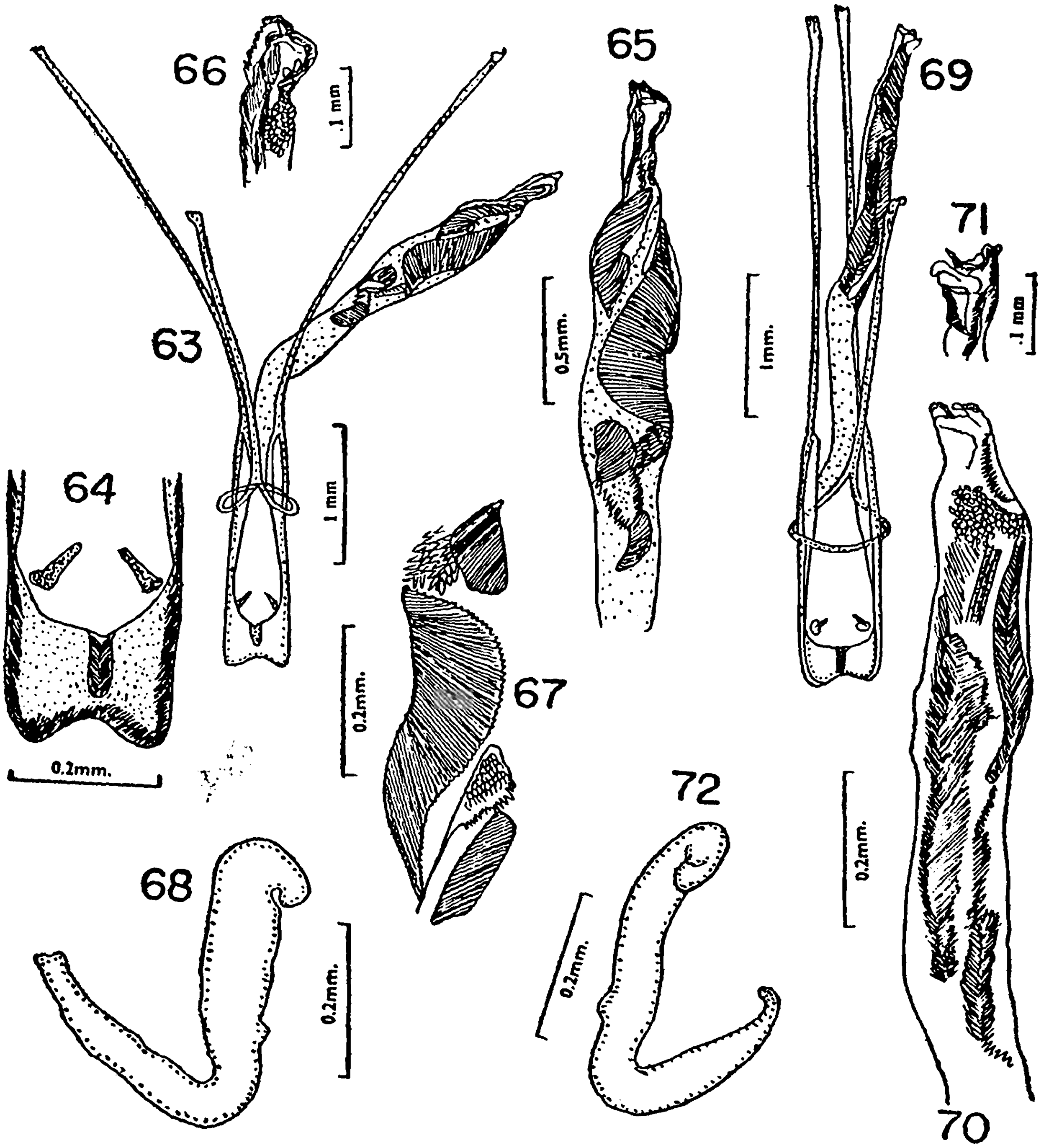
Figs. 53-62 : *Myllocerus severeni* Marshall : 53- aedeagus, 54- distal end penis, 55- endophallic armature, 56- spermatheca, 57- bursa copulatrix. *Myllocerus curvicornis* (Fabricius) 58- aedeagus, 59- apical end penis, 60- endophallic armature, 61- spermatheca. 62- bursa copulatrix.

margin strongly sclerotized ; *endophallus* (Fig. 60) internal sac cylindrical, narrow, elongated ; armature well developed, present all along the length in the form of obliquely arranged dense chitinous spines ; apical margin hooked, a number of denticles present apically. *Spermatheca* (Fig. 61) ramus bulbous, hooked, collum reduced papillae like, cornu narrow, medium sized almost 'L' shaped, moderately chitinized ; *bursa copulatrix* (Fig. 62) club shaped, apical margin irregular, stalk like base, 2 weakly chitinized patches present.

14. **Myllocerus subfasciatus** Guerin, 1843

(Fig. 63-68)

Myllocerus subfasciatus Guerin, 1843 *Voy. Deless*, 2 : 54.



Figs. 63-72 : *Myllocerus subfasciatus* Guerin : 63- aedeagus, 64- distal end penis, 65- internal sac, 66- apical end internal sac, 67- endophallic armature, 68- spermatheca, *Myllocerus andrewesi* Marshall, 69- aedeagus, 70- endophallic armature, 71-apical end—internal sac, 72- spermatheca.

Aedeagus (Fig. 63) medium, weakly sclerotized, subcylindrical apically, apical margin weakly convex, ostium reduced, *endophallus* (Figs. 65-67) well developed, undulating, elongated, narrow apically, endophallic armature present in the form of loosely coiled lateral bands (Figs. 65 & 67) arranged almost throughout the length of the sac, each band comprising obliquely arranged chitinous plates ; a bunch of denticles present in the apical half. *Spermatheca* (Fig. 68) strongly sclerotized ; ramus reduced, knob like, collum rudimentary tubercle like, cornu moderate, curved "V" shaped, truncate at margin.

15. **Myllocerus andrewesi** Marshall, 1916
(Figs. 69-72)

Myllocerus andrewesi Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 346-347.

Aedeagus (Fig. 69) medium sized, weakly scelerotized, apophyses rather long, basal piece weak, penis subcylindrical apically ; apical margin moderately convex, ostium medium sized ; *endophallus* (Figs. 70 & 71) cylindrical, thin and long, strongly chitinized, armature in the form of patches of obliquely arranged longitudinal plates, tuberculated in apical half, apical margin spiniculate. *Spermatheca* (Fig. 72) ramus bulbous, twisted over the body, collum reduced papillae like, cornu rather small, strongly curved, hooked at apical end.

16. **Myllocerus discolor** Boheman 1834
(Figs. 73-76)

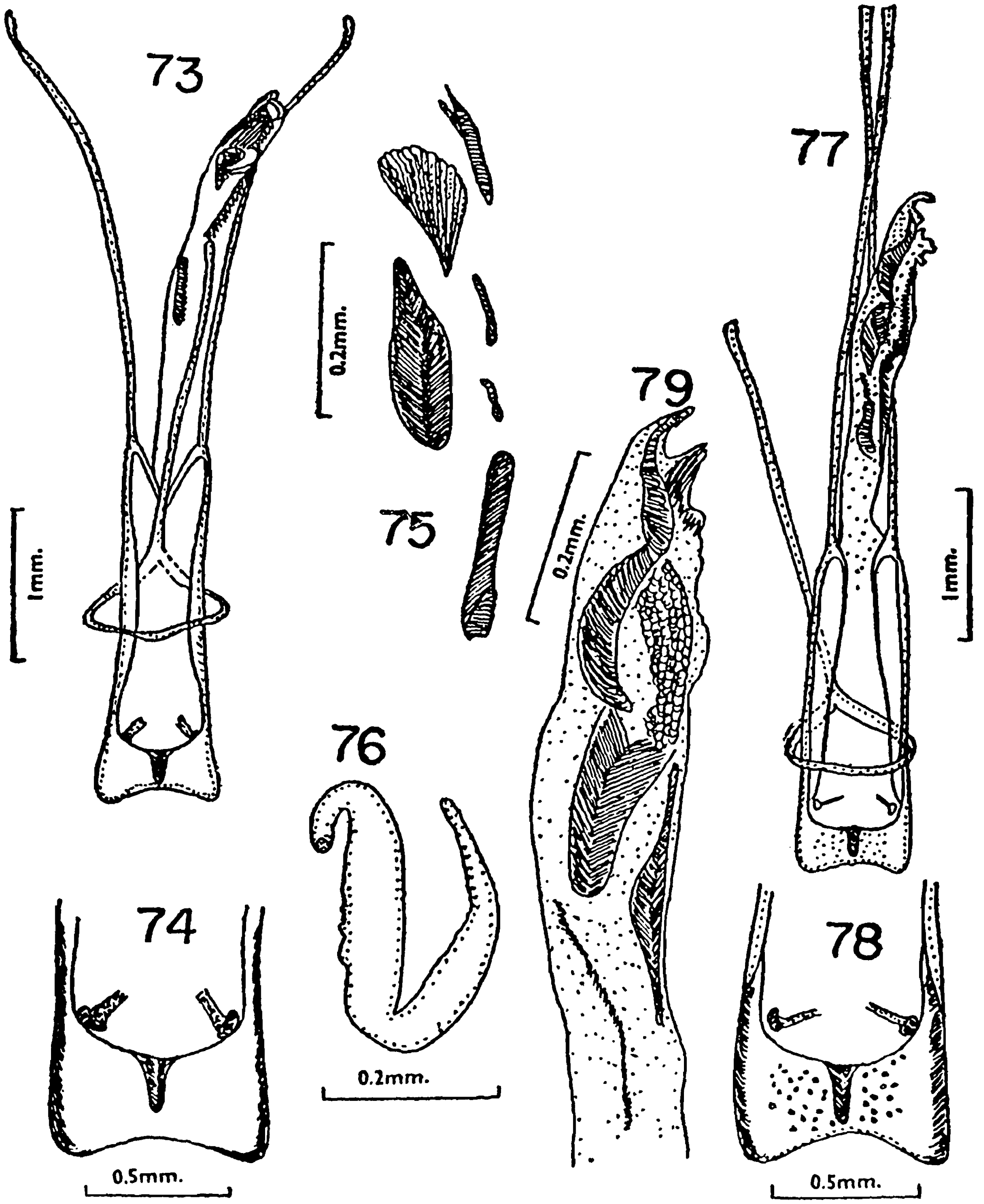
Myllocerus discolor Boheman, 1834, *Schonh, Gen. Curc.* 5 : 428.

Aedeagus (Figs. 73 & 74) medium sized, strongly sclerotized, penis subcylindrical in apical half, moderately curved apically, apophyses medium sized, manubrium medium ; *endophallus* (Fig. 75) rather small, tubercular, armature generally confined to apical half, present in the form of leaf shaped patches, scattered chitinous plates closely packed ; *spermatheca* (Fig. 76) medium sized, ramus inverted 'U' shaped, collum reduced, pappilate, cornu strongly curved, thin, tapering.

17. **Myllocerus discolor** var. *uniformis* Marshall, 1916
(Figs. 77-79)

Myllocerus discolor var. *uniformis* Marshall, 1916 *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 349-350.

Aedeagus (Fig. 77) medium sized, sclerotized, penis subcylindrical in apical half, apical margin moderately curved, apophyses medium, ostium not extending up to the apical margin of penis (Fig. 78); *endophallus* (Fig. 79) internal sac small, cylindrical, moderately chitinized ; armature present in the form of wavy longitudinal bands, each band comprises obliquely arranged chitinous plates, a patch of chitinous tubercles present in the apical half, apical margin divided like fingers.

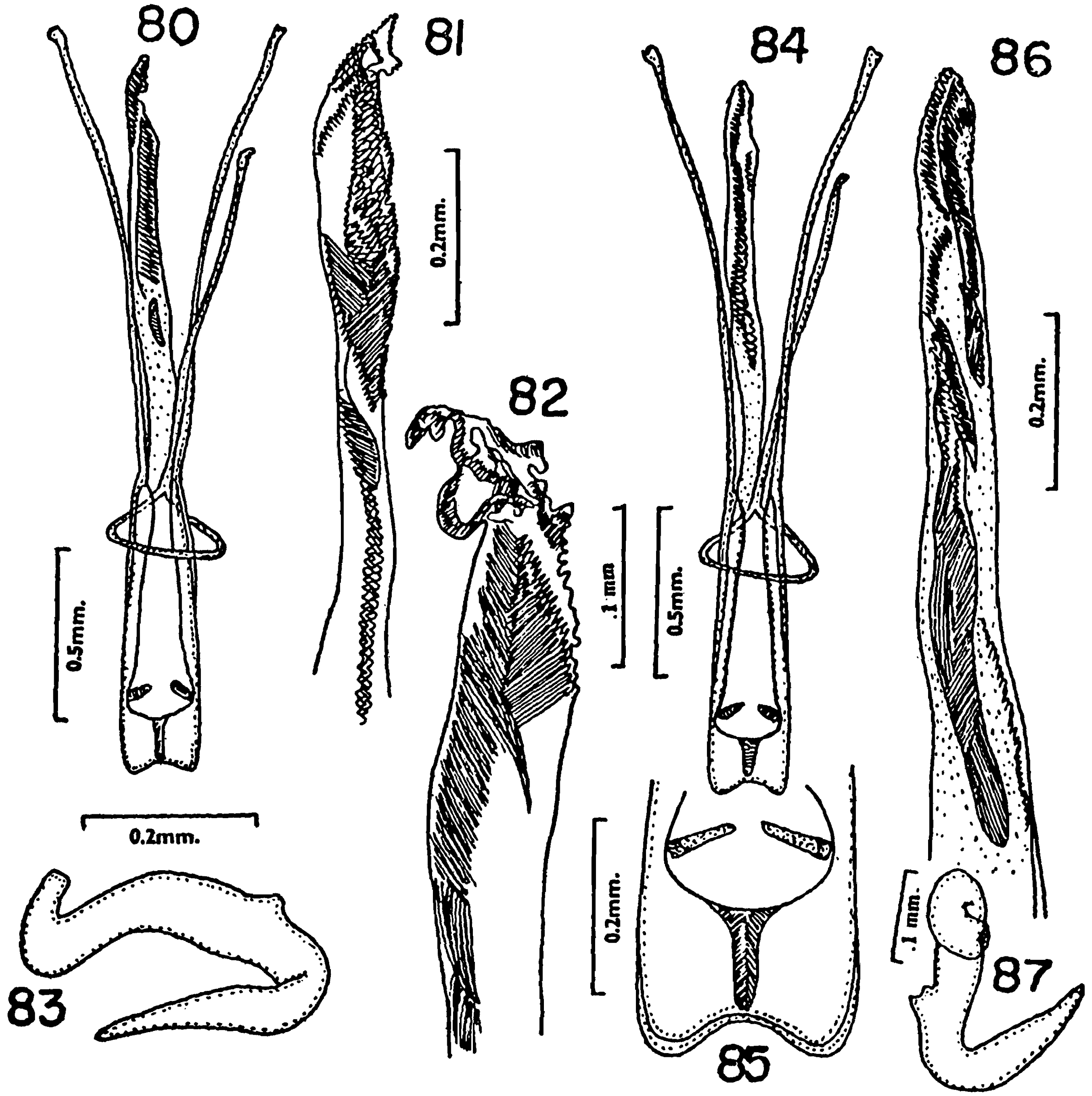


Figs. 73-79 : *Myllocerus discolor* Boheman : 73- aedeagus, 74- apical end penis, 75- endophallic armature, 76- spermatheca ; *Myllocerus discolor uniformis Marshall*, 77- internal sac, 78- apical end penis, 79- internal sac.

18. **Myllocerus 11-pustulatus** Faust, 1891
(Figs. 80-83)

Myllocerus 11-pustulatus Faust, 1891, *Stett. Ent. Zeit.*: 266.

Aedeagus (Fig. 80) rather small, weakly sclerotized, penis almost flattened, apical margin weakly curved, manubrium thin, long, ostium extending up to apical margin ; *endo-*



Figs. 80-87 : *Myllocerus 11-pustulatus* Faust : 80- aedeagus, 81- internal sac, 82- endophalic armature, 83- spermatheca *Myllocerus 11-puslulatus marmoratus* Faust : 84- aedeagus, 85- apical end penis, 86- endophallic armature, 87- spermatheca:

phallus (Figs. 82 & 83) internal sac elongated and cylindrical, *endophallic armature* well developed, a median row of obliquely arranged chitinous spines present in distal half, additionally chitinized tubercles present apically, apico-lateral margin serrated. *Spermatheca* (Fig. 83) capsule moderately sclerotized, ramus well developed curved like a beak, collum reduced rather distally placed from ramus, cornu moderately 'V' shaped, tapering.

19. **Myllocerus 11-pustulatus marmoratus** Faust, 1897

(Figs. 84-87)

Myllocerus marmoratus Faust, 1897, *Dent. Ent. Zeit.*,: 360.
Myllocerus 11-pustulatus var. *marmoratus*, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora*: *Curculionidae*): 352.

Aedeagus (Fig. 84) small, weakly sclerotized, penis flat, subcylindrical apically, apical margin moderately curved, ostium extending almost up to the margin, manubrium thin and long; *endophallus* (Fig. 86), internal sac thin, elongated and cylindrical almost uniformly broad, armature developed, present in the form of long chitinous bands along the whole length of the sac, each band comprises closely arranged oblique chitinous plates. *Spermatheca* (Fig. 87) capsule sclerotized, ramus well developed twisted over the body, collum medium, margin sinuate, cornu small, curved 'V' shaped.

20. **Myllocerus kashmirensis** Marshall, 1916

(Figs. 88-92)

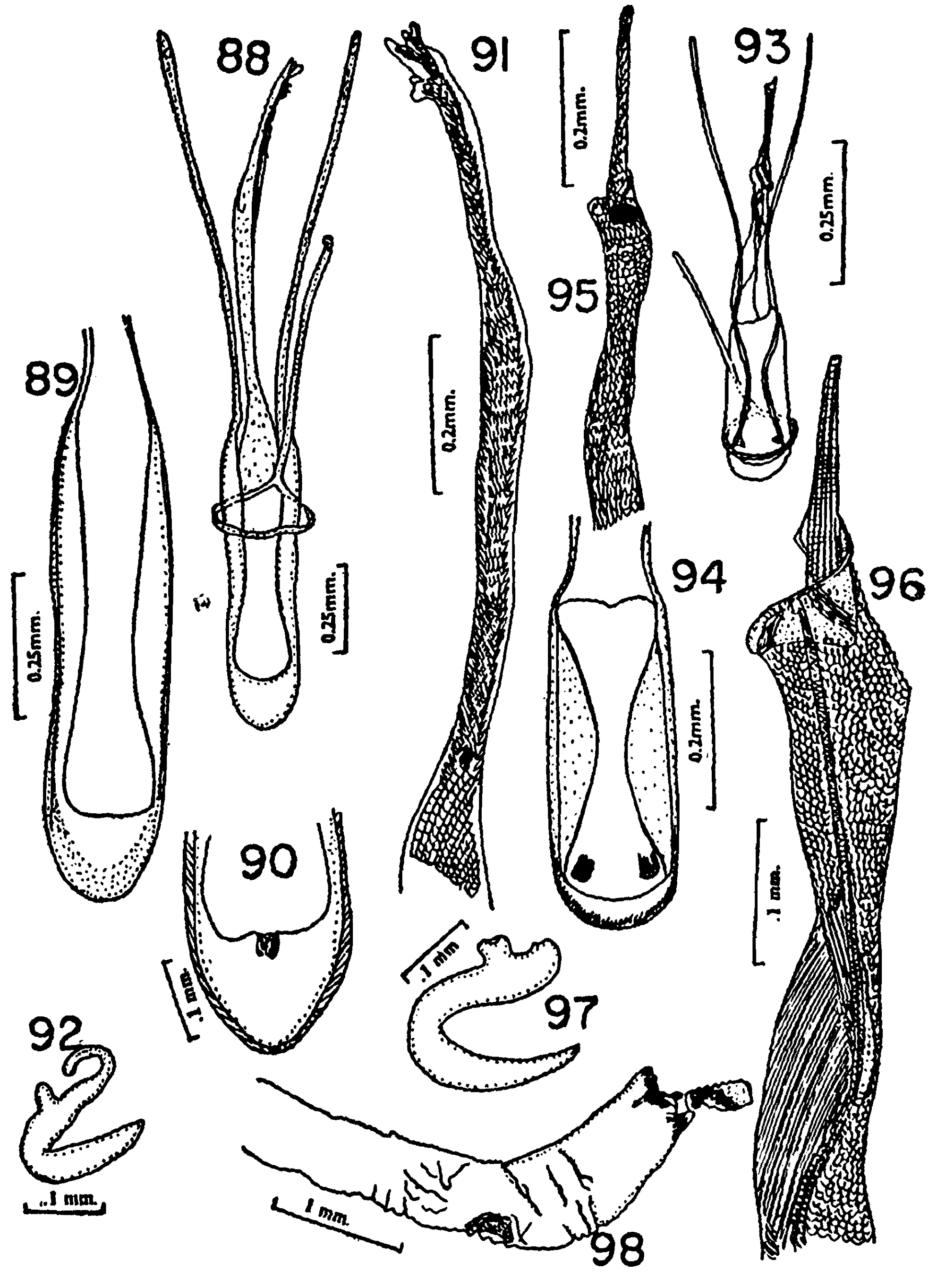
Myllocerus kashmirensis Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora*: *Curculionidae*): 308.

Aedeagus (Figs. 88-90) rather small, strongly sclerotized, penis broader both distally and apically, apical margin strongly convex, ostium rudimentary, basal piece weak, manubrium medium, *endophallus* (Fig. 91) internal sac, elongated ribbon like, strongly chitinized, armature present in the form of closely arranged transverse rows of spines throughout the length of the sac, a patch of chitinous plates present at the base. *Spermatheca* (Fig. 92) rather small but well sclerotized, ramus thin curved like a hook, collum well developed, knob like, cornu rather small, 'V' shaped.

21. Myllocerus ignavus Marshall, 1916

(Figs. 93-98)

Myllocerus ignavus Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*): 312.



Figs. 88-98 : *Myllocerus kashmirensis* Marshall : 88- aedeagus ; 89- penis ; 90- apical end penis ; 91- endophallic armature ; 92- spermatheca ; *Myllocerus ingnavus* Marshall ; 93- aedeagus ; 94- penis ; 95- internal sac ; 96- endophallic armature ; 97- spermatheca ; 98- bursa copulatrix.

Aedeagus (Fig. 93) much small, weakly sclerotized, penis uniformly broad, subcylindrical, apical margin semi-circular, ostium reduced (Fig. 94) basal piece weak, manubrium reduced, apophyses long ; *endophallus* (Figs. 95 & 96) internal sac spathe like, flattened, apical margin projecting like a finger, strongly chitinized, rows upon rows of chitinous tubercles present throughout its length. *Spermatheca* (Fig. 97) ramus reduced, truncate, collum medium sized, knob like, cornu medium sized, tapering apically, broadly 'V' shaped ; *bursa copulatrix* (Fig. 98) club shaped, cylindrical, sinuate laterally, chitinous portion rudimentary.

22. **Myllocerus setulifer** Desbr. 1898
(Figs. 99-102)

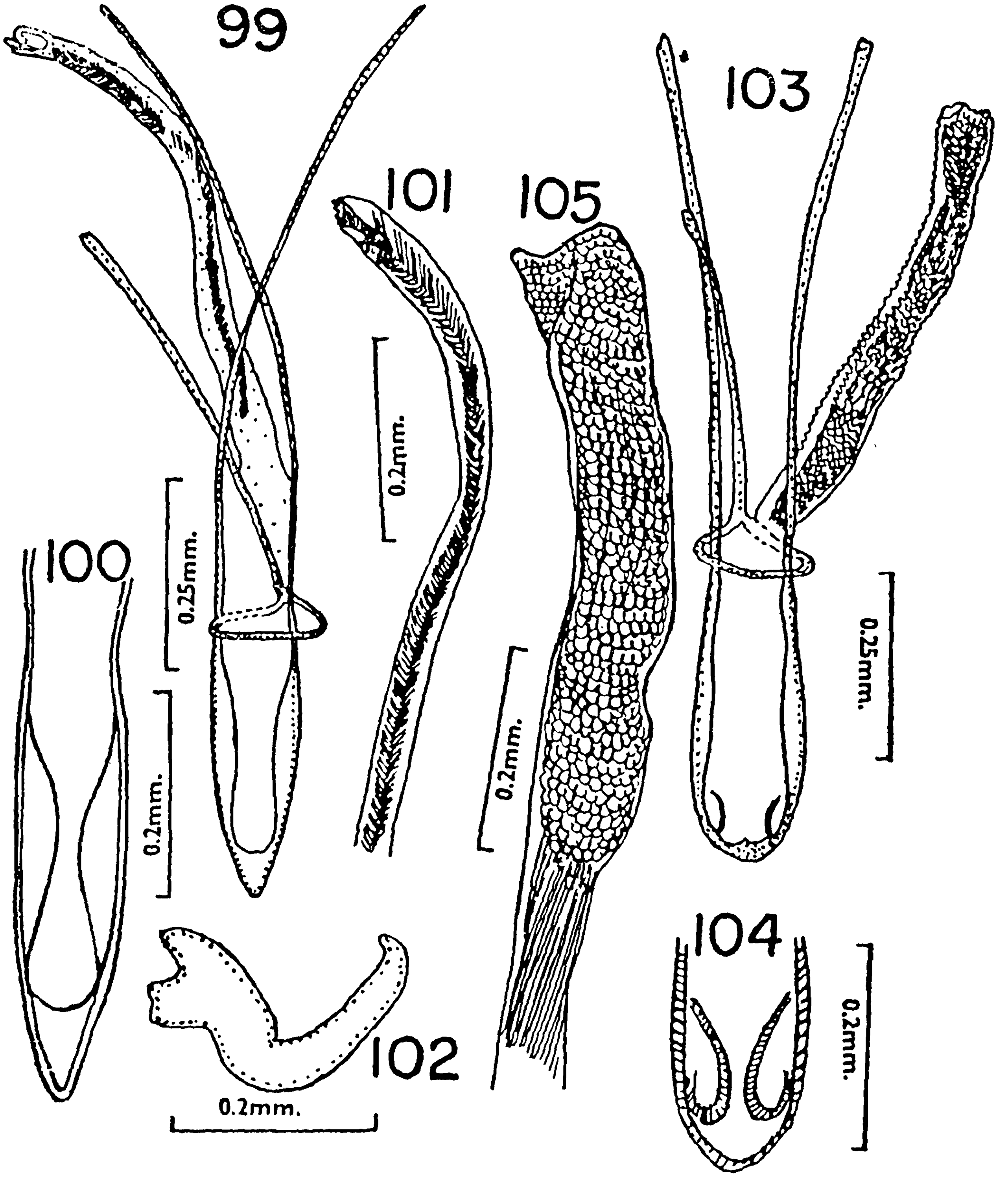
Myllocerus setulifer Desbr., 1899, *Indian Mus. notes,* 4 : 111.

Aedeagus (Fig. 99) weakly sclerotized, penis reduced, apophyses at least two times as long as penis, manubrium long, ostium reduced ; penis with apical margin much elongated, widest at the middle, tapering towards both ends ; *endophallus* (Fig. 101) internal sac chord like, elongated, uniformly chitinized throughout its length, endophallic armature present in the form of obliquely arranged bipinnate plates. *Spermatheca* (Fig. 102) ramus conical, collum knob like, weakly bisinuate, cornu medium sized, hooked at apical end, strongly sclerotized.

23. **Myllocerus lineatocollis** Boheman, 1843
(Figs. 103-105)

Myllocerus lineatocollis Boheman, 1843, *Gen. Curc.*, 7 (1): 23.

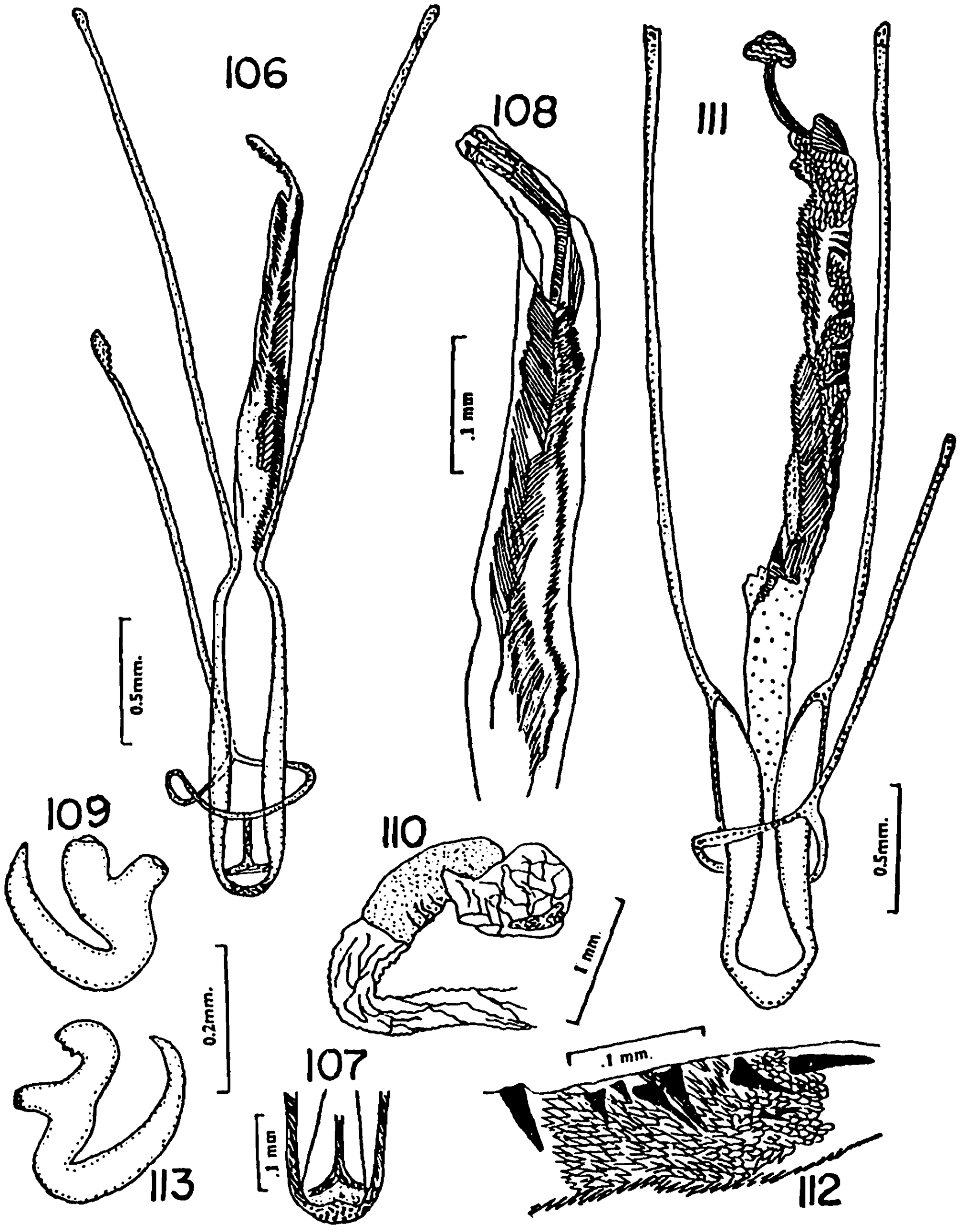
Aedeagus (Fig. 103) weakly sclerotized, penis reduced, flattened, laterally substraight, apically strongly convex, apophyses long, basal piece weak, manubrium medium ; *endophallus* (Fig. 105) internal sac flattened ribbon like, densely chitinized throughout its length, endophallic armature in the form of transversally arranged rows upon rows of chitinous tubercles of uniform intensity.



Figs. 99-105 : *Myllocerus setulifer* Desbrochers : 99- aedeagus ; 100- penis ; 101- endophallic armature ; 102- spermatheca. *Myllocerus lineatocollis* Boheman ; 103- aedeagus ; 104- apical end penis ; 105- endophallic armature.

24. **Myllocerus crinitus** Marshall, 1916
(Figs. 106-110)

Myllocerus crinitus Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 322.



Figs. 106-113 : *Myllocerus crinitus* Marshall : 106- aedeagus ; 107- apical end penis ; 108- endophallic armature ; 109- spermatheca ; 110- bursa copulatrix. *Myllocerus dorsatus* Fabricius ; 111- aedeagus ; 112- endophallic armature ; 113- spermatheca.

Aedeagus (Figs. 106 & 107) moderately sclerotized ; penis well developed, sclerotized, laterally sub parallel, apically strongly convex basal piece well developed, manubrium long, apical margin serrated ; *endophallus* (Fig. 108) internal sac tubular, elongated, moderately chitinized almost throughout its length, endophallic armature in the form of a band of obliquely arranged chitinous spines, margin serrated, hooked apically. *Spermatheca* (Fig. 109) with both ramus and collum well developed, tuberous, arranged in 'V' shape ; cornu arcuate. *Bursa copulatrix* (Fig. 110) club shaped, medium sized, chitinous patch distinct.

25. **Myllocerus dorsatus** (Fabricius, 1798)

(Figs. 111-113)

Curculio dorsatus Fabricius, 1798, *Ent. Syst. Suppl.* 1173.
Myllocerus dorsatus, Marshall, 1916, *Fauna Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 320.

Aedeagus (Fig. 111) medium sized, moderately sclerotized, arcuate, penis flattened distally, apical margin strongly convex, laterally sub-parallel, ostium reduced, basal piece medium sized, apophyses long, thin ; *endophallus* (Figs. 111 & 112) subcylindrical, laterally sinuate, thickly chitinized, a club shape projection at the apical end, endophallic armature comprises transversally arranged chitinized tubercles, thorny chitinous structures present in between (Fig. 112). *Spermatheca* (Fig. 113) half hooked, margin sinuate, collum well developed, protruding, knob like, cornu strongly arcuate.

26. **Myllocerus impressicolis** Marshall, 1916

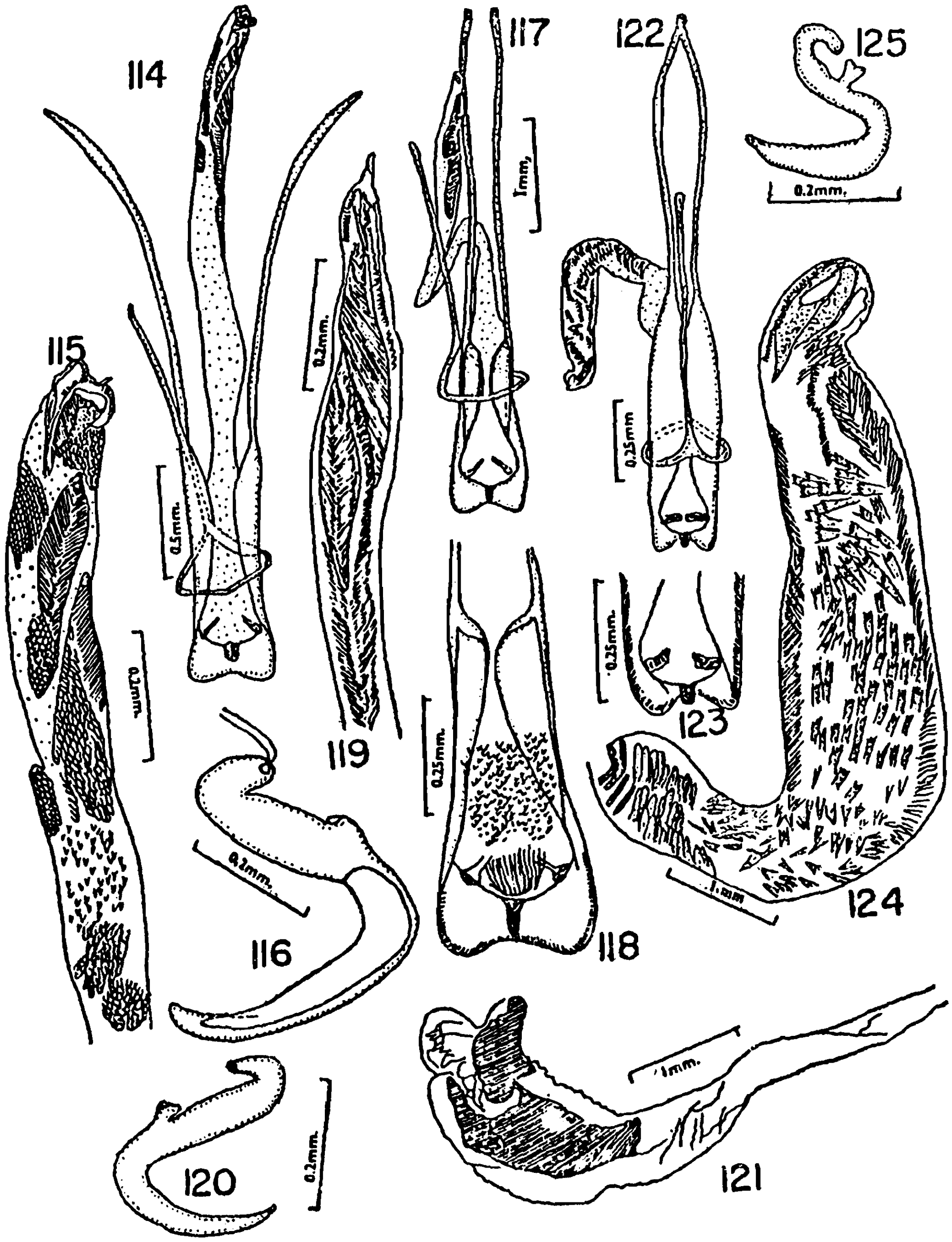
(Figs. 114-116)

Myllocerus impressicolis Marshall, 1916, *Faun. Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*): 331.

Aedeagus (Fig. 114) medium sized, weakly sclerotized, subcylindrical, apical margin curved, ostium reduced, basal piece and manubrium medium, apophyses strongly diverging, long ; *endophallus* (Fig. 115) internal sac cylindrical, elongated, moderately chitinized, endophallic armature varying in shape such as chitinized plates, papillae, scales and tubercles, each arranged in distinct patches along the length of sac. *Spermatheca* (Fig. 116) rather large, body strongly sclerotized, ramus well formed, vertical hook like, collum reduced, tuberous, cornu weakly arcuate, almost at 'U' angle.

27. **Myllocerus echinarius** Marshall, 1916
(Figs. 117-121)

Myllocerus echinarius Marshall, 1916, *Faun. Brit. India, Coleoptera* (*Rhychophora* : *Curculionidae*) : 332.



Figs. 114-125 : *Myllocerus impressicolis* Marshall : 114- aedeagus ; 115- endophallic armature ; 116- spermatheca *Myllocerus echinarius* Marshall : 117- aedeagus ; 118- penis ; 119- endophallic armature ; 120- spermatheca ; 121- bursa copulatrix. *Myllocerus suspiciens* Marshall : 122- aedeagus ; 123- apical end penis ; 124- endophallic armature ; 125- spermatheca.

Aedeagus (Figs. 117 & 118) well formed, strongly sclerotized, penis arcuate, widest apically, apical margin strongly curved, thickly chitinized, ostium well developed, apophyses medium, almost sub-parallel, *endophallus* (Fig. 119) internal sac spindle shaped, thickly chitinized throughout its length, endophallic armature in the form of two distinct spindle shaped patches of obliquely arranged bipinnate chitinized plates in the upper half, serrated apically. *Spermatheca* (Fig. 120) ramus pointed, hook like, collum reduced, knobbed, obliquely directed, cornu medium, weakly arcuate, broad 'V' shaped ; moderately sclerotized. *Bursa copulatrix* (Fig. 121) elongated sac like, comprises a large chitinized patch, arcuate laterally.

28. **Myllocerus suspiciens** Marshall, 1916
(Figs. 122-125)

Myllocerus suspiciens Marshall, 1916, *Faun. Brit. India, Coleoptera (Rhynchophora : Curculionidae*: 306.

Aedeagus (Figs. 122 & 123) rather small, weakly sclerotized, penis flattened, apical margin strongly curved, broadest in the middle, ostium well developed extending beyond the apical margin, apophyses rather small, curved apically ; *endophallus* (Fig. 124) internal sac cylindrical, sac like, bulbous at both ends, thickly chitinized, endophallic armature in the form of scattered pectinate spines at the centre of the internal sac, while chitinous papillae present both apically and distally, apical margin serrated. *Spermatheca* (Fig. 125) body weakly sclerotized, bulbous, ramus inverted 'V' shaped, collum tuberous, cornu gently arcuate, broadly 'V' shaped.

TAXONOMIC IMPORTANCE OF GENITALIA WITHIN GENUS *MYLLOCERUS* SCHONHERR

Marshall (1916) recorded 71 species of Genus *Myllocerus* from the Indian subregion and defined it as a somewhat large and heterogenous genus which requires subdivision. He opined that a number of additional characters may have to be studied for this purpose. His key for identification of the Indian species is based on various combinations of characters. With a view to facilitate the identity of the large number of species of this complex genus, taxonomic importance of the genitalia has been discussed here. Recently Kumar & Sen-Sarma (1974) described the genitalia of 16 Indian species of tribe Cyphicerinii of this family and studied its taxonomic importance. Based on the present study of the male and female genitalia of the 28 species of *Myllocerus*, it is noted that this is a very useful taxonomic character even in large genus like *Myllocerus*, *Male genitalia* : on the basis of shape of penis, the taxa studied can be distinctly grouped into two, (1) with the apical margin of penis strongly convex (e. g. *Myllocerus kashmirensis*, *M. ignavus*, *M. setulifer*, *M. lincatocollis*, *M. crinitus* and *M. dorsatus*), (2) the remaining species can be put in the second group in which the apical margin of penis is bisinuate. This grouping broadly tallies with Marshall's (1916) subgroup of the species of *Myllocerus* on the basis of bisinuate or truncate prothorax.

The endophallic armature is clearly distinct in its shape, structure and distribution and is characteristic for each species, thus should alone be sufficient to identify the males of the species.

Female genitalia : sclerotized body of *spermatheca* is again very distinct in shape and size for each species (Plate 1). It shows a fascinating range of structural variations in its shape in different species and the spermatheca of one species can not be confused with another in the material studied. The shape of ramus, collum and cornu all demonstrate very distinct variations. Aslam (1961) has also shown it as an excellent taxonomic character in family Curculionidae.

The *bursa copulatrix* also varies distinctly in its shape and size in different species studied.

ACKNOWLEDGEMENTS

My grateful thanks are due to the Director, Zoological Survey of India, Calcutta and Dr. G. S. Arora, Scientist 'SE', Northern Regional Station, Zoological Survey of India, Dehradun, for various facilities and encouragement. Grateful thanks are also due to Dr. P. K. Sen-Sarma, the then Director, Biological Research and Dr. Pratap Singh, Forest Entomologist, Forest Research Institute, Dehradun, for allowing to study the material present at the Entomology Branch.

SUMMARY

Male and female genitalia of 28 Indian species of genus *Myllocerus* Schonherr have been described and illustrated. *Aedeagus* is typically annulate type ; female genitalia is tubular type ; *spermatheca* is sclerotized and *bursa copulatrix* is well developed. Shape of penis, pattern of endophallic armature, shape of spermatheca and bursa copulatrix are very useful characters to separate the species.

PLATE1

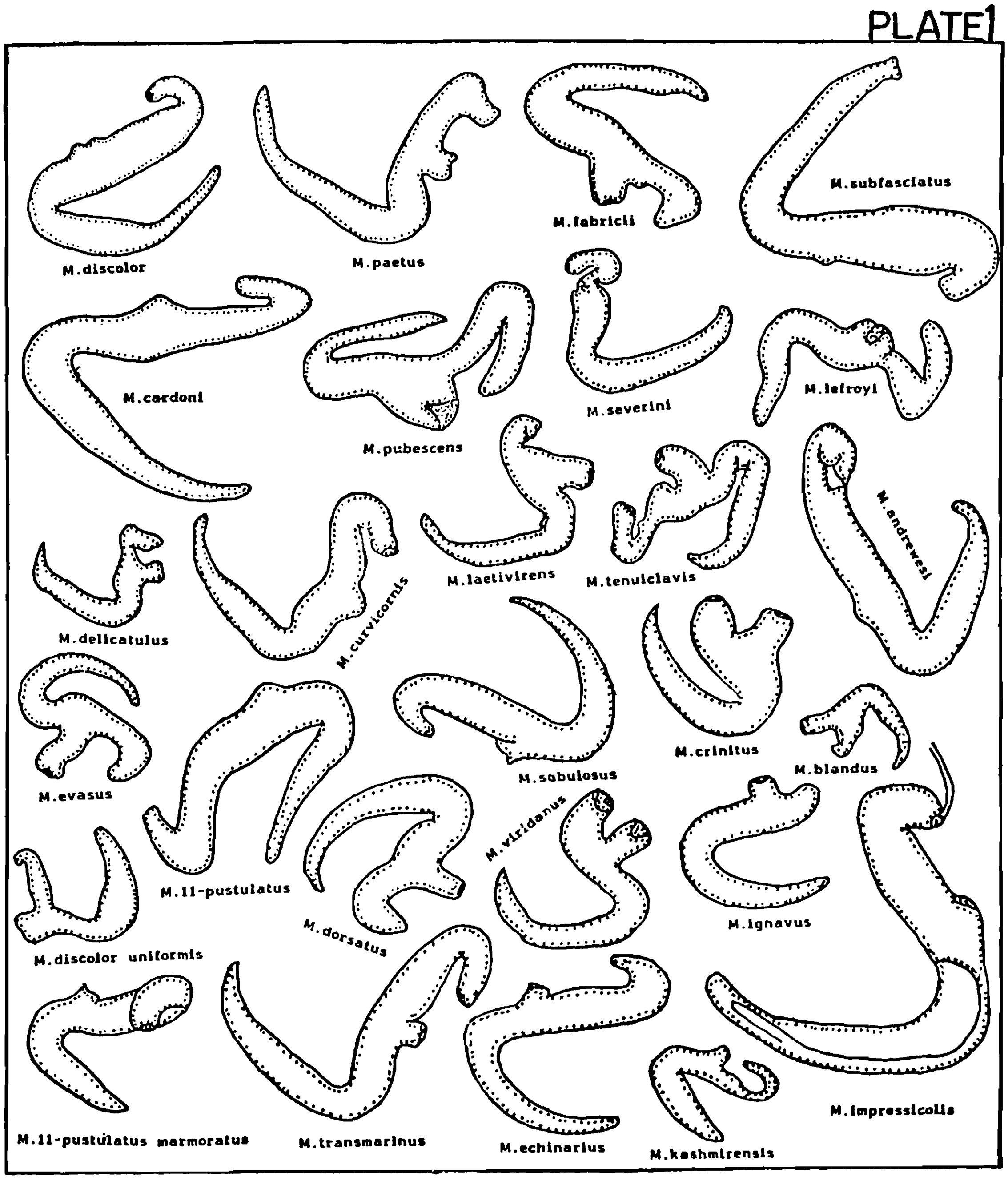


PLATE 1 : Spermatheca of different species of genus *Myllocerus* Schn.

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Rec. zool. Surv. India, 94 (1) : 55-61, 1994

ON A COLLECTION OF PODOCINIDAE (ACARINA : MESOSTIGMATA)

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INTRODUCTION

In the course of faunistic surveys from various localities in India, a few podocinid mites were collected. On examination, the collection was found to comprise three species, one belonging to genus *Podocinella* Evans and Hyatt 1957, and the remaining two of the genus *Podocinum* Berlese 1982. The present paper deals with *Podocinella meghalayaensis* sp. nov. from Meghalaya, *Podocinum pacificum* Berlese from Uttar Pradesh and *P. sagax* (Berlese) from Nancowry (Bay Island).

The type specimen is in the collection of the Zoological Survey of India, Calcutta.

Podocinella meghalayaensis sp. nov.

Female : Dorsal shield 0·385 mm long, 0·260 mm wide, a few setae are not discernible (fig. 1).

Tritosternum bipartite, laciniae pilose. Sternal shield bearing 3 pairs of setae, anterior margin not distinguishable. Each metasternal shield bearing a seta. Endopodal plate present between coxae II and IV. Genital shield truncate posteriorly, with a pair of setae. Ventri-anal shield 0·110 mm long, 0·180 mm wide, bearing 9 setae (fig. 2).

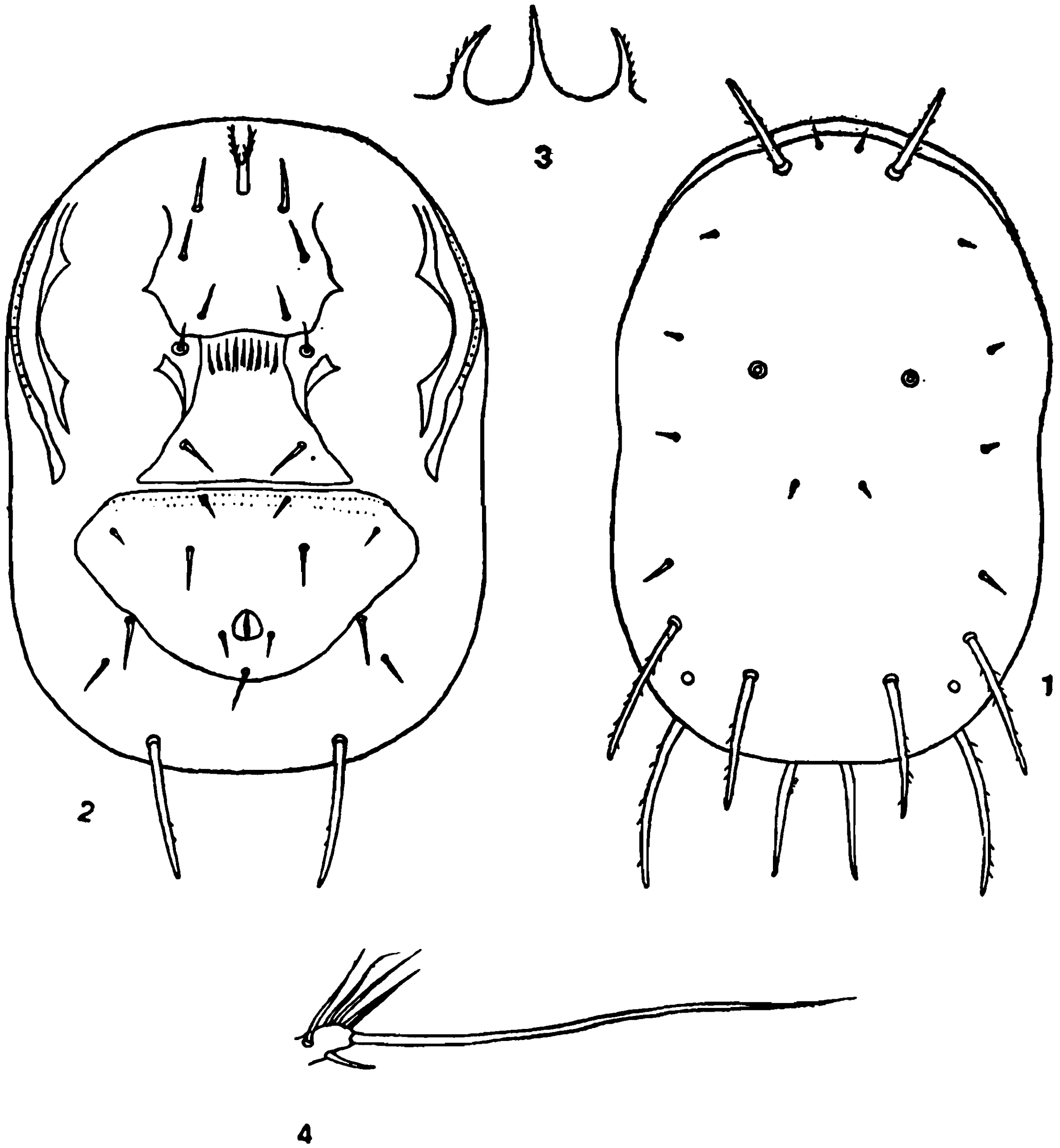
Tectum as in fig. 3. Chelicera not examined. Apotele and gnathosoma usual for the genus.

Tarsus I bearing a very long terminal seta (fig. 4). Tibia and tarsus of leg I 0·150-0·162 mm and 0·270-0·275 mm long respectively.

Male : Unknown.

Habitat : Holotype female, fern litter, along a road to Cherrapunji, United Khasi and Jaintia Hills District, Meghalaya, 3.12.1969, Dr. S. K. Bhattacharyya.

Remarks : The new species markedly differs from other known species in the chaetotaxy of dorsal shield, in the structure of ventri-anal shield and tectum.



Figs. 1-4 : *Podocinella meghalayaensis* sp. nov.
Female : 1. Dorsum ; 2. Venter ; 3. Tectum ; 4. Tarsus I (in part).

Podocinum pacificum Berlese

Podocinum pacificum Berlese, 1896, *Atti. Soc. Veneto* (2) 2 2 : 319.
Podocinum pacificum : Berlese, 1913, *Redia* 9 : 83.
Podocinum pacificum : Berlese, 1913a, *Acarotheca Italica*, Firenze : 85.
Podocinum pacificum : Evans & Hyatt, 1957, *Ann. Mag. nat. Hist.* 12 10 : 917, 923.

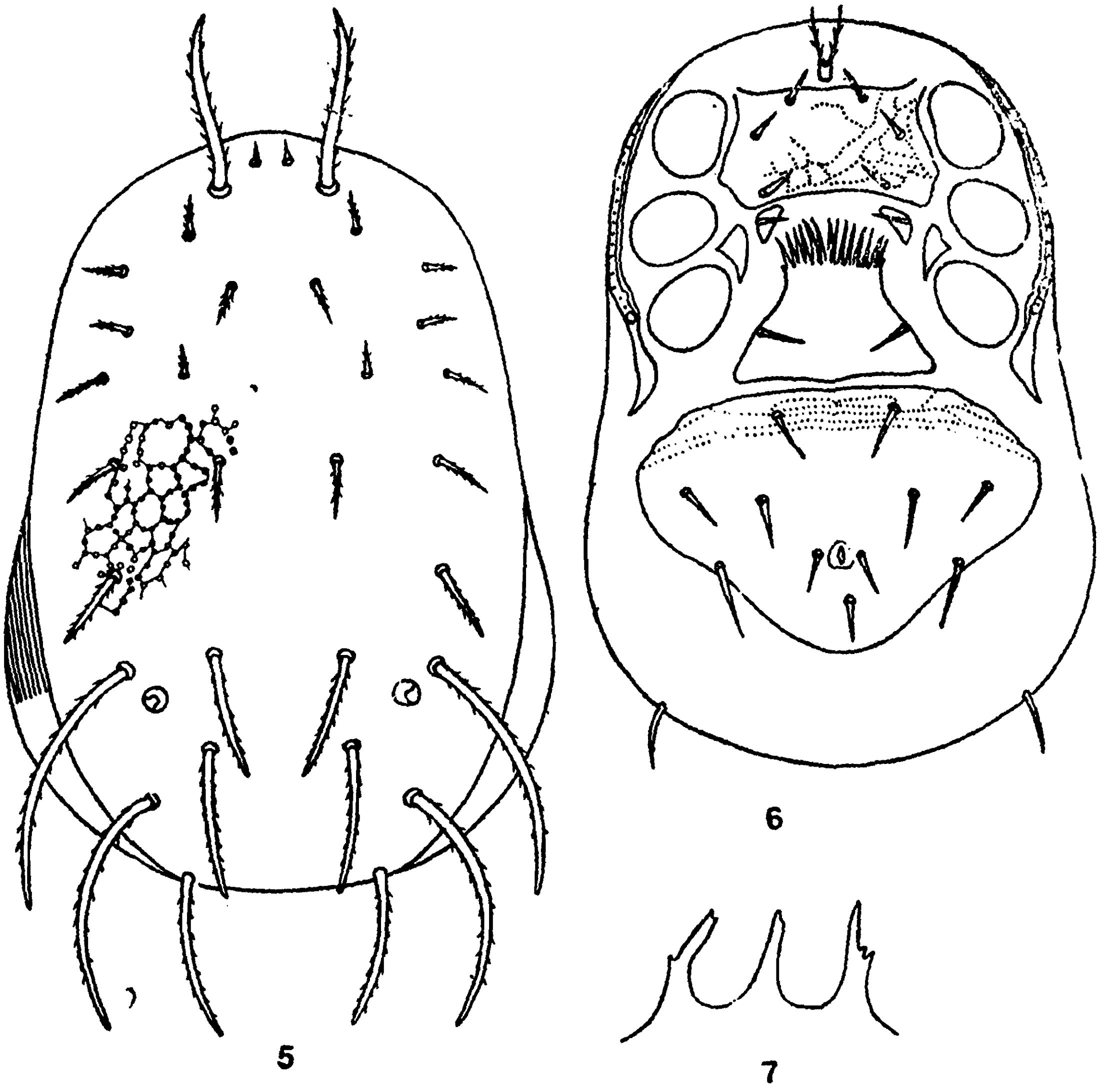
Podocinum pacificum : Westerboer, 1963. Beitrage zur Systamatik und Okologie Mittleuropaischer Acarina 2 : 203.

Podocinum pacificum : Athias-Henriot, 1959. *Acarologia* 1 : 24.

Podocinum pacificum : Ishikawa, 1969. *Bull. Nat. Sci. Mus. Tokyo.* 12 1 : 62.

Podocinvm pacificum : Ishikawa, 1970. *Annot. Zool. Japan* 43 (2) : 112, 113.

Female : Dorsal shield 0·437-0·475 mm long, 0·247-0·285 mm wide, entire covered by minute projections forming polygonal net work, with 16 pairs of setae of which vertical setae only simple (fig. 5).



Figs. 5-7 : *Podocinum pacificum* Berl.
Female : 5. Dorsum ; 6. Venter ; 7. Tectum.

Tritosternum bipartite, laciniae pilose. Sternal shield reticulate, with 3 pairs of setae. Metasternal plate bearing a seta. Endopodal plates present between coxae III and

IV. Genital shield truncate posteriorly, bearing a pair of setae. Ventri-anal shield carrying 11 setae. Stigma at level of coxa IV, peritreme extending beyond coxa I. Post-stigmatal extension of peritrematal shield extended well beyond posterior to coxa IV (fig. 6).

Tectum as in fig. 7. Chelicera not examined. Apotele three-tined. Gnathosoma with 4 pairs of setae. Corniculi horn-like ; 6 rows deutosternal denticles.

Leg I with 2, very long terminal setae, subterminal setae. Tibia and tarsus of leg I 0·260-0·270 mm and 3·320-0·330 mm long respectively.

Distribution and habitat : This species has previously been recorded from Italy (Berlese, 1913a). Austria, Argentina, U.S.A., Sikkim (Evans and Hyatt, 1957), Algeria (Athias-Henriot, 1959), Japan (Ishikawo, 1969, 1970).

One female from rotten logs, Kaligarh Forest, Ranikhet, Almora District, Uttar Pradesh, 22.4.1971, Dr. S. K. Bhattacharyya. One female from rotten log, Kaligarh Forest, Ranikhet, Almora District, Uttar Pradesh, 22.4.1971, Dr. S. K. Bhattacharyya.

Remarks : *Podocinum pacificum* is recorded for the first time from India.

Podocinum sagax (Berlese)

Laelaps sagax Berlese, 1882, *Atti. Inst. Veneto* (5) 8 1 : 638.
Podocinum sagas (Berlese) : Berlese, 1882a, *Bull. Soc. ent. ital.*, 14 : 340.
Podocinum sagax : Berlese, 1882b, Acari, Myriopoda et Scorpiones Fasc. 1, tav. 1.
Podocinum sagax : Berlese, 1913, *Redia* 9 : 83.
Podocinum sagax : Evans and Hyatt, 1957, *Ann. Mag. nat. Hist.* 12, 10 : 917, 918.

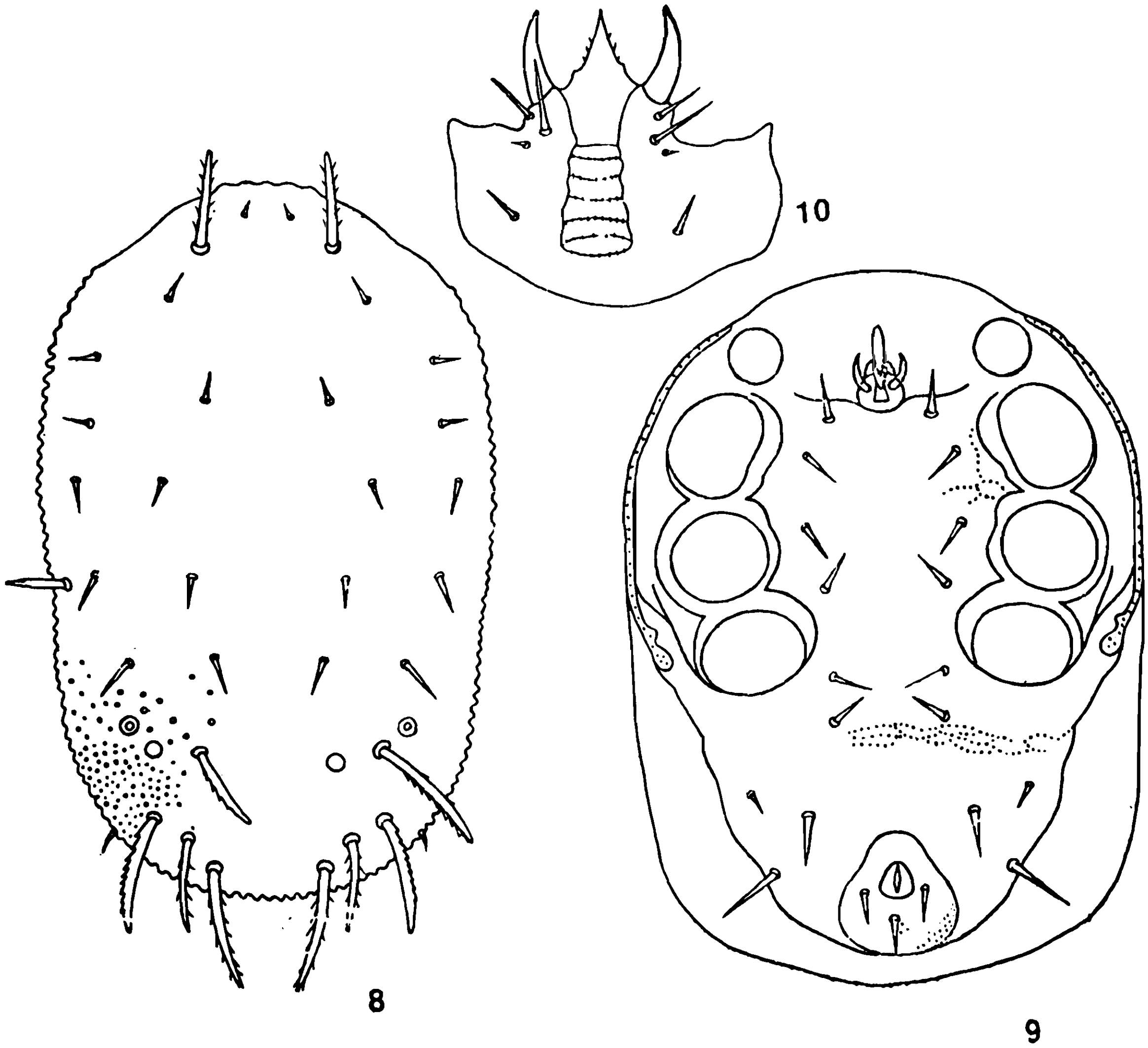
Male : Dorsal shield 0·375 mm long, 0·250 mm wide, without posterolateral incisions, almost entirely covered by minute projections, an aberrant setae present in left side but in right a seta and a pore interchanged placement, also without any setal base fig. 8.

Tritosternum bipartite. Genital orifice pre-sternal. Holoventral shield being 21 setae. Stigma lying at level of coxa IV and extending beyond coxa I. Peritrematal shield fused with podal elements between coxae III and IV and holoventral shield (fig. 9).

Tectum basically trispinate. Pedipalp five segmented ; apotele three-tined. Chelicera chelate-dentate, arthrodial processes at the base of movable digit. Spermatodactyl grooved, free distally, terminal end pointed and serrated. Ventrally gnathosoma with 4 pairs of setae. Corniculi horn-like, long. Hypostomal process slightly fringed. Deutosternal denticles arranged in six rows (fig. 10).

Leg I without ambulacrum, with a pair of very long terminal setae and two long subterminal setae.

Distribution and habitat : This species has already been recorded from Italy (Berlese, 1812, 1913), British Isles (Turk, 1953), Argentina, Indonesia, Jamaica (Evans and Hyatt, 1957).



Figs. 8-10 : *Podocinum sagax* (Berl.)
Male : 8. Dorsum ; 9. Venter ; 10. Gnathosoma.

One female from rotten banana plant, Government Agriculture Farm, Camorta, Nancowry. Nicobar District, 18.1.1975, Dr. S. K. Bhattacharyya.

Remarks : This is the first record of the species from India.

ACKNOWLEDGEMENT

I wish to thank Dr. A. K. Ghosh, Director, Zoological Survey of India, Calcutta, for the facilities.

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Rec. zool. Surv. India, 94 (1) : 63-73, 1994

COLLEMBOLAN POPULATION OF UNDISTURBED GRASSLAND AND FOREST FLOOR OF BURDWAN

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INTRODUCTION

In West Bengal the Collembolan ecology is largely confined to the alluvial soils. Attempts have been made by workers like Choudhuri and Roy (1966, '67 and '72) and Mitra *et al* (1977), Hazra (1978a, b) to study the qualitative and quantitative ecology of Collembolan population in undisturbed grassland, wood land soils and agricultural lands of gangetic West Bengal. However, most of these have been sporadic, moreover, most cases have failed to give a comparative account of the Collembolan population extracted from different habitats in same geographical area. In this communication therefore an attempt has been made to give a comparative picture of species composition and seasonal variation of Collembolan community in undisturbed grass land and forest floor of Burdwan.

LOCATION AND CHARACTERISTICS OF THE SAMPLING SITES

Two sampling sites were selected for this study. One of these was in the University Campus which was uncultivated and covered with thick carpet of grass and contained few herbs and shrubs like *Croton sparsiflora* (Euphorbiaceae), *Oldenlandia* sp. (Rubiaceae) and *Boerhaavia repens* (Nyclaginaceae) etc. The other plot was in the Baburbag Reserve forest near the University Campus. It was also uncultivated and undisturbed but thickly vegetated and contained a good number of herbs and shrubs like *Vitis trifolia* (Vitaceae), *Lantana camara* (Verbinaceae), *Mikania seandens* (Compositae), *Eclipta alba* (Compositae) and *Croton separsiflora* (Euphorbiaceae). Besides herbs and shrubs the plot also contained trees like *Tectona grandis* (Verbinaceae), *Shorea robusta* (Dipterocarpaceae), *Ficus religiosa* (Urticaceae), *Bombax malabaricum* (Bombacaceae) and *Dalbergia sisso* (Leguminosae) etc. Shade was found to prevail throughout the day in the forest plot.

Both these plots experienced moderate amount of rainfall (90-120 cm/yr) and contained soils which were alluvial in nature, sandy loam in texture and slightly acidic in reaction.

METHODS AND MATERIAL

Both plots were sampled at 10 days' interval and altogether 216 samples (108 samples from each plot) were collected over a period of 3 years (January 1986 to December 1988). The plots were sampled by a steel borer as employed by Dhillon and Gibson (1962) and the cores were extracted by a Tullgren funnel modified by MacFadyen (1952). Soil moisture was determined directly by an infrared moisture balance and walkley and Black's method (1934) was followed to evaluate organic carbon content of soil. Soil temperature was recorded by a soil thermometer and pH was determined by an electric pH meter.

RESULTS

The Collembolan fauna obtained from the two sites were different in faunal composition as well as in numerical abundance. The population recorded at forest floor was found to be higher than that of grassland (Fig. 1). The fauna extracted from the forest site included 4 genera, like *Lepidocyrtus*, *Cyphoderus*, *Hypogastrura* and *Lobella* and the grassland plot contained forms like *Lepidocyrtus*, *Cyphoderus*, *Proisotoma* and *Onychiurus*. The genus *Lepidocyrtus* was found to be predominant in both the plots. The forest samples in general yielded a higher population than those collected from the grassland throughout the period of investigation.

The total fauna extracted from both the plots showed to some extent an irregular trend of fluctuation with a maxima in August-September and a minima in April-May (Fig. 1) The population in both the plots, exhibited a decline from February onwards and reached its peak in August-September. From October to January very little numerical variation was observed. The dominant species *Lepidocyrtus* showed its peak in August (Table 1).

Soil factors like temperature, moisture, pH and organic carbon did not exhibit remarkable variation. The temperature in grassland varied between 18°C to 34·33°C and in forest between 19·16° to 33·83°C. Soil reaction in both the cases was acidic and the value of pH ranged between 5·8 to 6·7 in grassland and between 5·5 to 6·5 in forest. The moisture content in forest and grassland varied between 3·7% to 7·53% and 3·51% to 7·2% respectively. Organic carbon had a higher concentration in forest plot which ranged from 0·44% to 1·76% while the concentration in the grassland plot varied between 0·63% and 1·22% (Fig. 2).

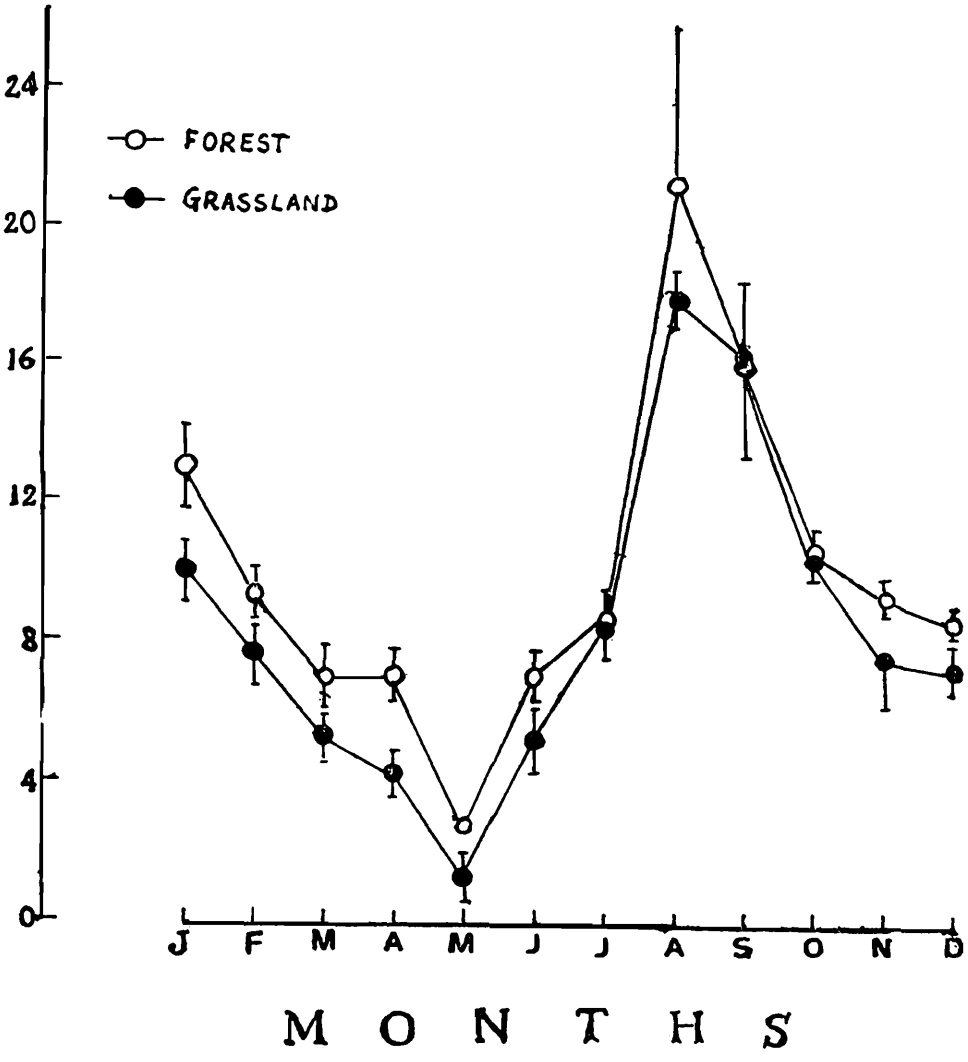

Fig. 1 : Seasonal Fluctuation of Collembola population in grassland and forest plot.

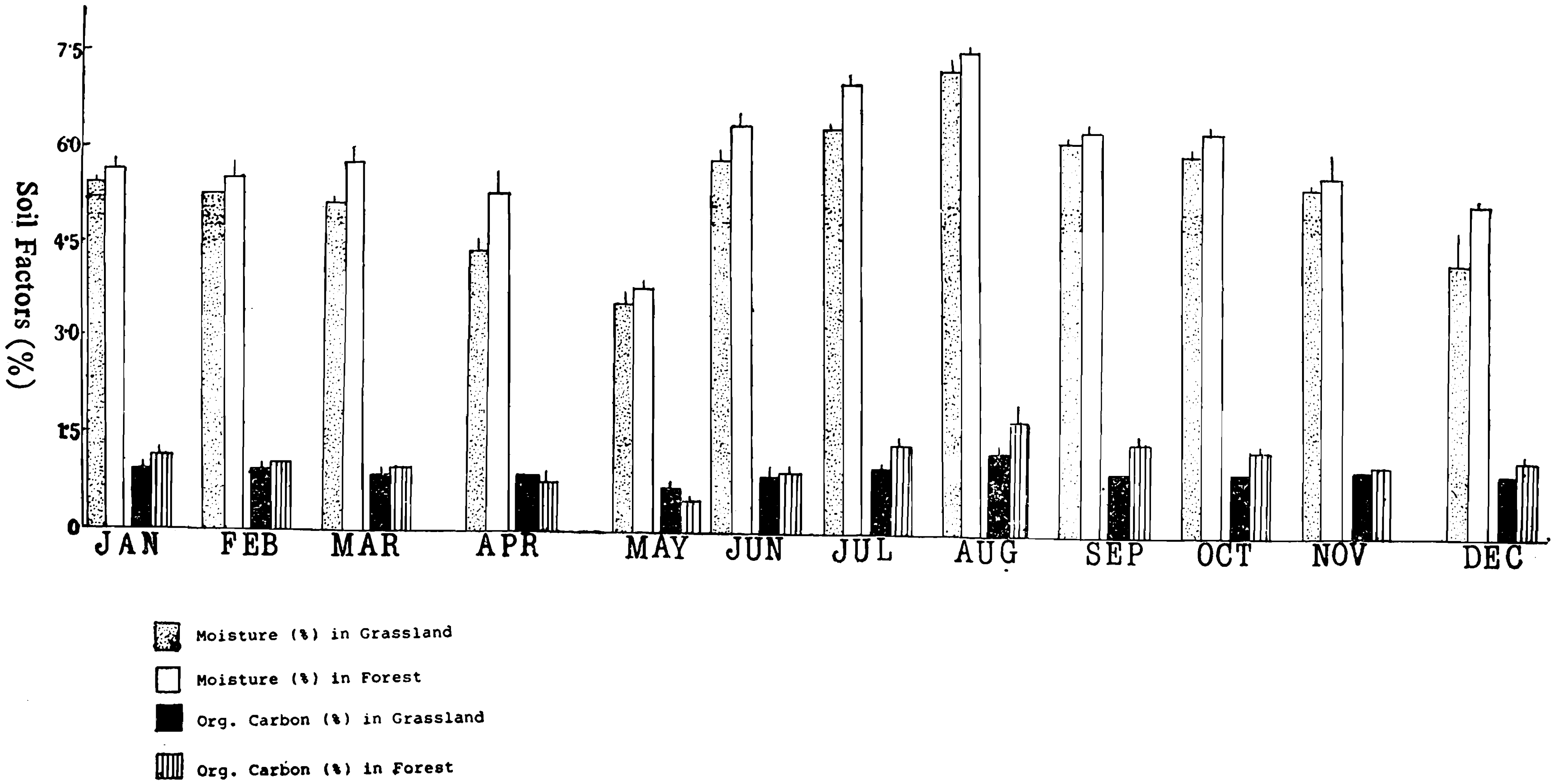

Fig. 2 : **Variation of Moisture and Organic Carbon in grassland and forest plot.**

DISCUSSION

In both the plots the present data depicts a positive correlation of Cllembolan population with the edaphic factors like the moisture and organic carbon content (Fig. 3, 4). Similar results were also obtained by Choudhuri and Roy (1972), Davis (1963), Haarlov (1960), Hazra and Choudhuri (1981, 1983), Poole (1961).

In summer months (i.e. April-May) the samples yielded low population in both the plots when the temperature was significantly high and moisture was appreciably low. The temperature in this study showed significant but negative correlations with the population (Fig. 5). This might be due to the fact that the rise of temperature is expected to cause greater rate of evaporation from the soil making it dry in the minimum population in summer is generally attributed to both the lesser water content and the physical instability of the humus layer in this soil conditions. As a result a lean population was obtained in summer and this corroborates with the findings of Choudhuri and Roy (1972), Hazra and Choudhuri (1983).

The soil reaction in both the plots exhibited very little variation and was well within the tolerance range of most of the species (Choudhuri and Roy, 1967, 1971, 1972). Accordingly it did not exert any impact either on speeies composition or on seasonal variation.

The forest plots supported a larger population in comparison to that of grassland which might be due to prevalence of moist hnmid climate, relatively greater abundance of plant remains and high organic content and thus affording stable food supply. But the forest plot in this case did not support a very large fauna as reported by Murphy (1953), Price (1973, 1975) from temperate and coniferous forests where little layers were considerably thick. As both the plots remained undisturbed the changes in microclimate occurred due to changes in rainfull, temperature, growth of vegetation and inhabiting microflora.

The monsoon peak in both the plots was probably due to increased levels of organic carbon, moisture and moderate temperature.

In winter months all those factors showed little changes and the population was more or less constant. The trends of seasonal variation as observed in this study were consistent with the findings of Loots and Ryke (1966), Choudhuri and Roy (1972), Choudhuri and Hazra (1981, '83), Results presented in this study showed that the qualitative and

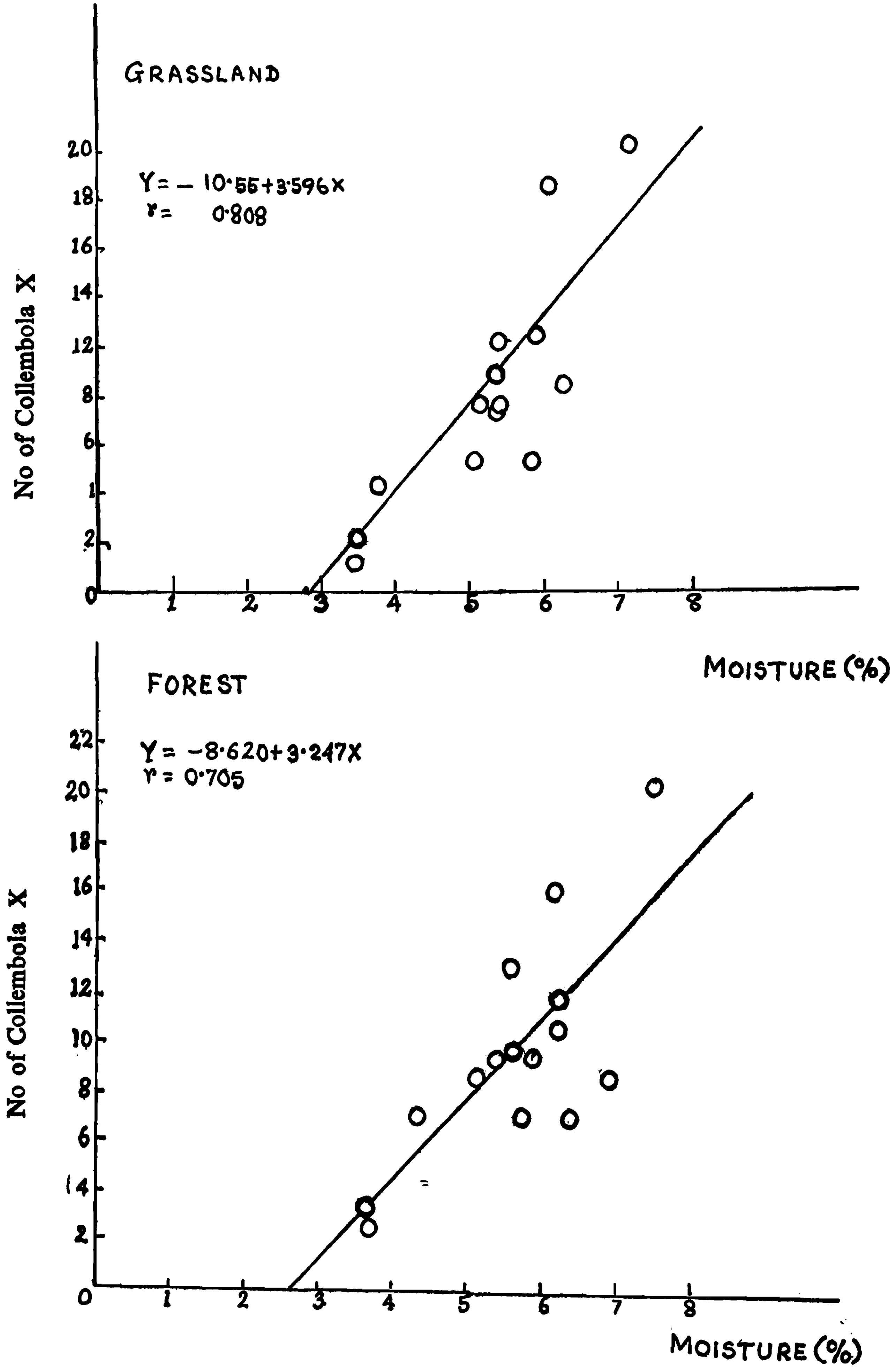

Fig. 3 : Showing regression line alongwith the scattered diagrams of Collembola on Moisture at grassland and forest plot.

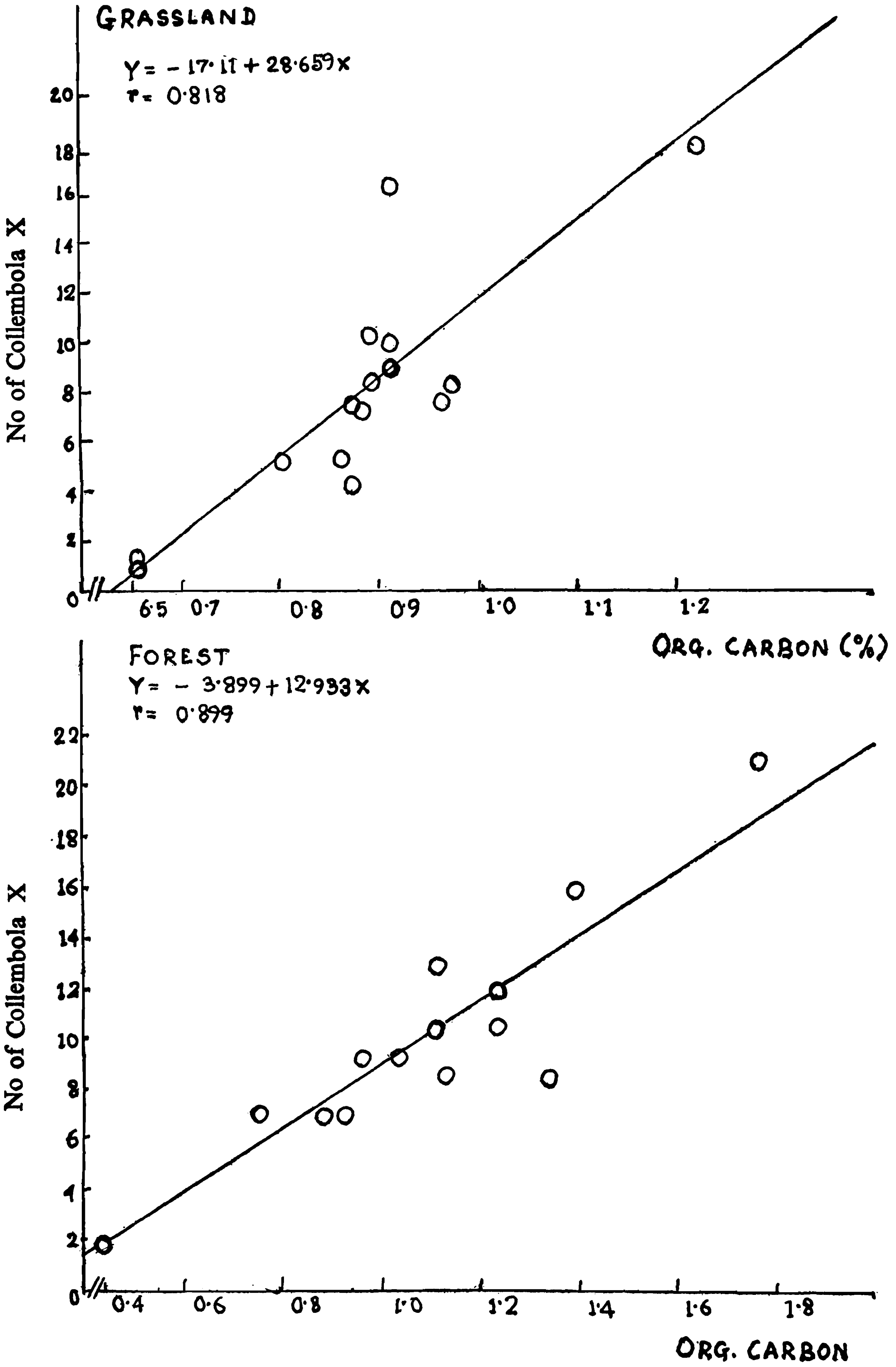

Fig. 4 : Showing regression line alongwith the scattered diagrams of Collembola on Organic Carbon at grassland and forest plot.

quantitative differences in faunal composition were due to local differences in the substrate composition which probably exerted profound influence on the pattern of population structure.

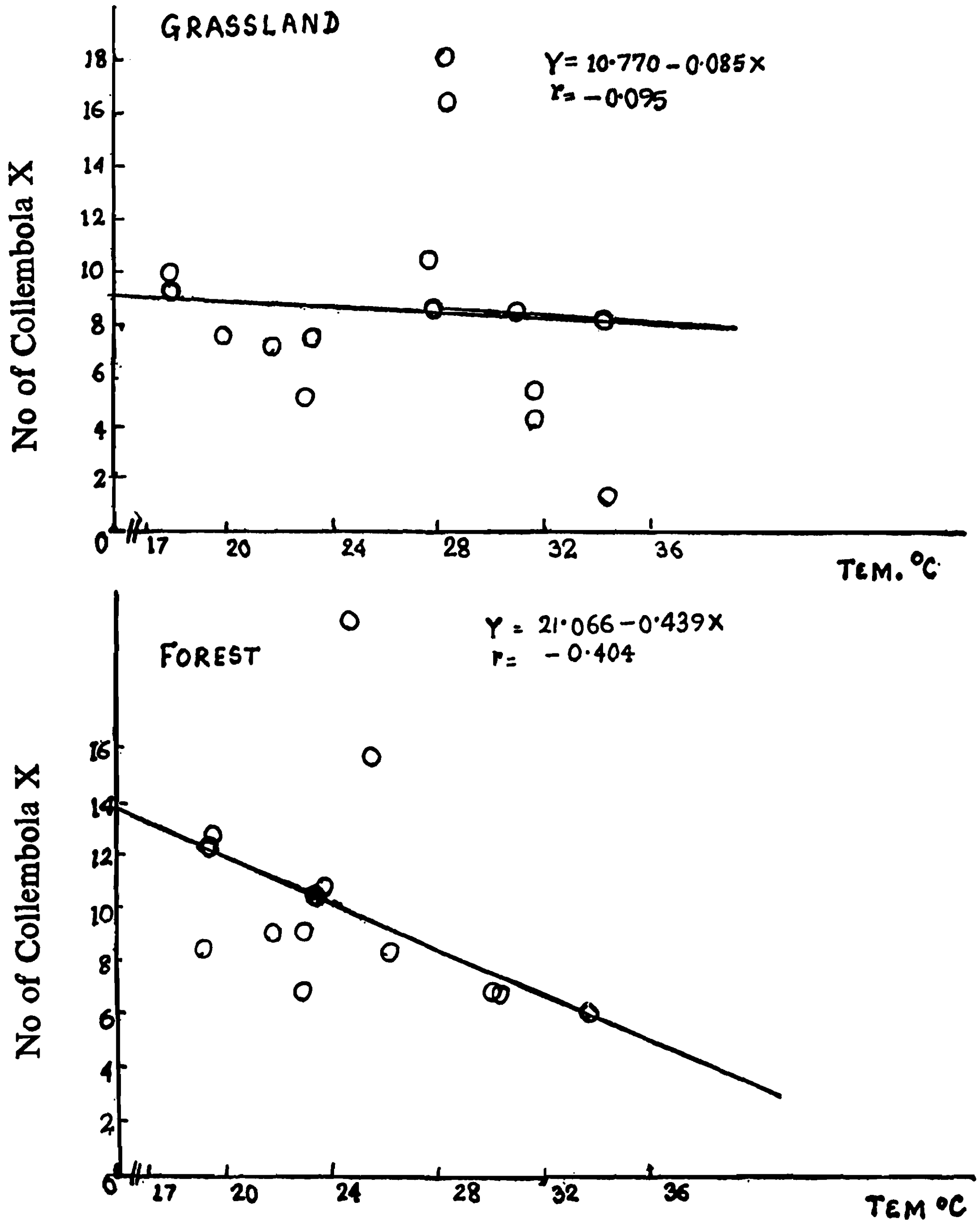

Fig. 5 : Showing regression line alongwith the scattered diagrams of Collembola on temperature at grassland and forest plot.

SUMMARY

This communication presents the results of an ecological study of Collembolan population of Burdwan. Two sampling sites, one in the University Campus and the other in the adjacent reserve forest were selected for sampling from where altogether 216 samples were collected over a period of three years. The uncultivated plots in the University Campus were covered with thick carpet of grass and contained few herbs and shrubs while the forest floor besides trees also contained a thick surface vegetation. The plots experienced an average rainfall and contained soils which were alluvial in nature, sandy loam in texture and grey in colour. The Collembolan fauna encountered belonged to six genera of which the genera *Lepidocyrtus* and *Cyphoderus* were common to both the plots. The forest floor supported a fauna which was numerically high. The total population in both the cases exhibited an irregular trend of fluctuation being maximum in August-September and minimum in April-May. Of the four edaphic factors studied moisture and organic matter exhibited significant positive correlation with population while the other two factors (temperature and pH) were either negatively correlated of showed no correlation at all.

ACKNOWLEDGEMENT

Authors are thankful to the authorities of Zoological Survey of India for identification of the Collembolan specimens.

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Rec. zool. Surv. India, 94 (1) : 75-86, 1994

STUDIES ON THE OCCURRENCE OF THE LIGHT TRAPPED ADULTS OF RICE YELLOW BORER, *TRYPORYZA INCERTULAS* (WALKER) (PYRALIDAE, LEPIDOPTERA) IN THE SALINE TRACTS OF WEST BENGAL

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INTRODUCTION

Light tarps are known to be an important tool in understanding the insect behaviour. In spite of controversy over its use for prediction of occurrence (Southwood, 1978), the phototropic insects of agricultural importance are monitored by daily collection of adults with the aid of various types of light-traps (Southwood, 1978 pp. 258). Emphasis is now being placed for obvious reasons in determining the periodical peaks of adult occurrence in crop fields to rationalise the time of surveillance, pesticide application or releasing of egg-parasitoids (Torii, 1964). The rice yellow borer, *Tryporyza incertulas* (Walker), is known to be an important stalk-borer pest in all rice-growing tracts of West Bengal. The species does not have any other alternative host plant. The information based on the monthly mean catches (Banerjee and Pramanik, 1964) and also, on the surveys of the damage indexed areas (Nath *et. al*, 1978) was so far in vogue for monitoring the pest in rice fields. But this deterministic approach ignored the life history of the insect, thus resulting in poor return of output.

Stochastic model of analyses of the catch data has been made in the present work to find out the number of broods and the time of peak occurrence of the moth in the saline rice growing areas of West Bengal, where the intensity of attack is high but the scope for a repeated sampling is limited. This region is also important, because it covers three major

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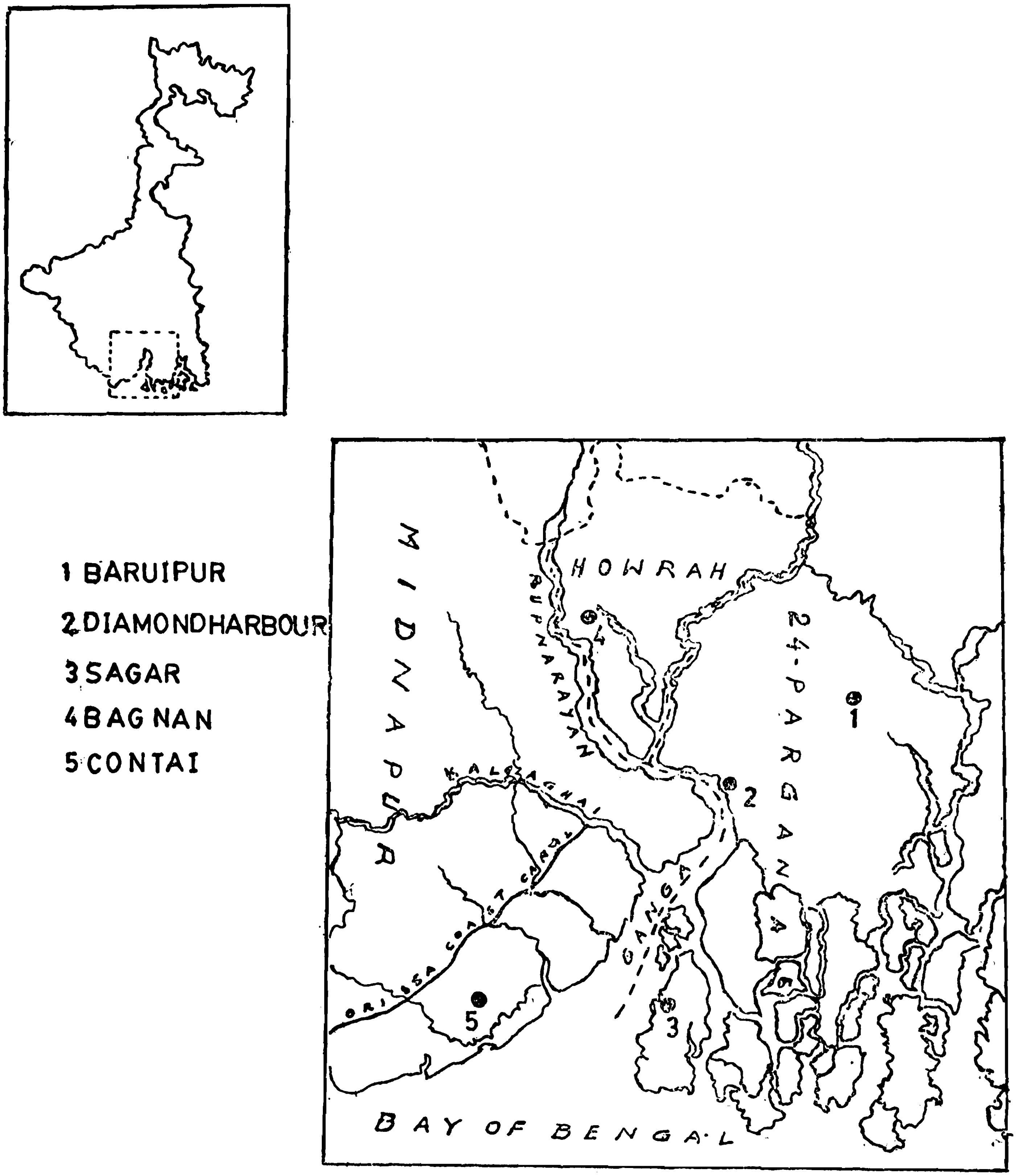

Fig. 1 : Saline tracts of West Bengal and approximate location of the Light Traps.

districts (South 24-Parganas, Howrah and Midnapur) of West Bengal where rice is grown as the only major crop (vide Fig. 1).

MATERIALS and METHODS

The 'Chinsurah-type' light-trap (Banerjee and Basu, 1955) was set up in Government Agricultural Farms at Baruipur (Dist. South 24-Parganas), Diamond Harbour (Dist. South 24-Parganas), Sagar (Dist. South 24-Parganas), Bagnan (Dist. Howrah) and Contai (Dist. Midnapur). These farms are located in the saline tracts of West Bengal, where only one rice crop of local varieties is grown during monsoon. The traps were operated daily from dusk to dawn. The rice yellow borer moths were separated from the collection, their number was counted and recorded by daily workers, especially trained for this purpose. The data were also analysed stochastically. For this purpose, the total days (period) of moth emergence were divided, taking 5 days as unit. The 5-day unit, which was also the average duration of egg-stage under normal field conditions, was adopted after Ishikura (1950). The catches of each such unit were consolidated with unit period designated as the time point. The annual data of catches from all the foregone localities were grouped on the basis of their periodic rise and fall. The number of such groups was considered as corresponding to that of broods. For every brood, the time point started serially from 1 to any number actually observed therein. The time point was conveniently used to draw inferences on the number of median catch out of the temporally distributed cumulative counterpart representing the sigmoid curve in arithmetic scale and varying widely in shape and size at different localities. In the next phase of analyses, all the exercises were devoted to get linearity of the sigmoid curve along with the cumulation being changed to percentage-level which still showed a little amount of bulging. The figures in terms of cumulative percentage were, thus, transformed into probit after Fisher and Yates (1957). The time points were also transformed into $\log_{10}$ scale. The moving averages of log time point (independent variable, X) and the probit cumulative percentage catches (dependent variable, Y) were worked out by least square regression line with all the locations taken together for each brood. The peak time for the median adult emergence (Xm), and its confidence limit were estimated after Ishii (1956) and Torii (1964). Test for heterogeneity was made by χ^2_0 (Chi). The detailed procedure of data analysis for the first brood of the moth is as follows :-

The probit values of the cumulative percentage of moth catches at different localities against the respective time points are provided in table table below.

Time point (X)			Respective probit of the cumulative % (Y)				
Number	Dates	$\log_{10}$	Baruipur	Diamond Harbour	Sagar	Bagnan	Contai
1	2	3	4	5	6	7	8
1	(19.1-23.1)	0·00	—	2·49	2·25	0	2·74
2	(24.1-28·1)	0·30103	2·25	2·54	2·59	0	2·93
3	(29.1-2.2)	0·47712	2·42	2·63	2·88	0	3·02
4	(3.2-7.2)	0·60206	2·67	2·71	2·97	2·67	3·06
5	(8.2-12.2)	0·69897	2·95	2·71	3·35	3·29	3·41
6	(13.2-17.2)	0·77815	4·35	4·14	3·91	4·31	4·47
7	(18.2-22.2)	0·84510	5·03	4·97	4·98	5·12	5·32
8	(23.2-27.2)	0·90309	5·72	5·82	5·59	6·28	6·24
9	(28.2-4.3)	0·95424	6·56	6·40	5·77	6·88	6·79
10	(5·3-9.3)	1·0	6·64	6·43	5·84	6·94	6·84
11	(10·3-14·3)	1·04139	7·14	6·73	6·32	7·52	7·20

$\sum_{1}^{51} X = 37.2276$ $\sum_{1}^{51} Y = 234{\cdot}78$

$\bar{X} = 0{\cdot}729953$ $\bar{Y} = 4{\cdot}6035294$

$\sum X^2 = 4{\cdot}005581$ $\sum Y^2 = 149{\cdot}71716$

$\sum XY = 21{\cdot}32912$

$b = 5{\cdot}32485$

$$Xm = \bar{X} + \frac{5 - \bar{Y}}{b} = {\cdot}8055138$$

Antilog ·8055138=6·39 time point

Corresponding actual time = February, 15

Goodness of fit

$$X_0^2\ \text{(Chi)} = \sum Y^2 - \frac{(\sum XY)^2}{\sum X^2} = 36{\cdot}143 < X^2_{\text{(Chi)}}\ {\cdot}05 \text{ at } 50 \text{ df.}$$

Therefore, the heterogeneity is not significant and the regression is rectilinear.

Approximate confidence limit

$$95\%\text{CL of } X_m = X_m \pm \frac{t{\cdot}05 \text{ at } (n-2) \text{ df}}{b}\sqrt{\frac{1}{n}+\frac{(Xm-\bar{X})^2}{\sum X^2}}$$

$= {\cdot}8055138 \pm {\cdot}0550442$ ($= 6{\cdot}43 \pm 1{\cdot}13$ time point in Antilog)
Corresponding actual time=February 15±6.

RESULTS and DISCUSSION

Light-traps are widely used in the field of entomological work, as the regular catch of the phototropic insects is more or less ensured. Difficulties arise in so far as their use for

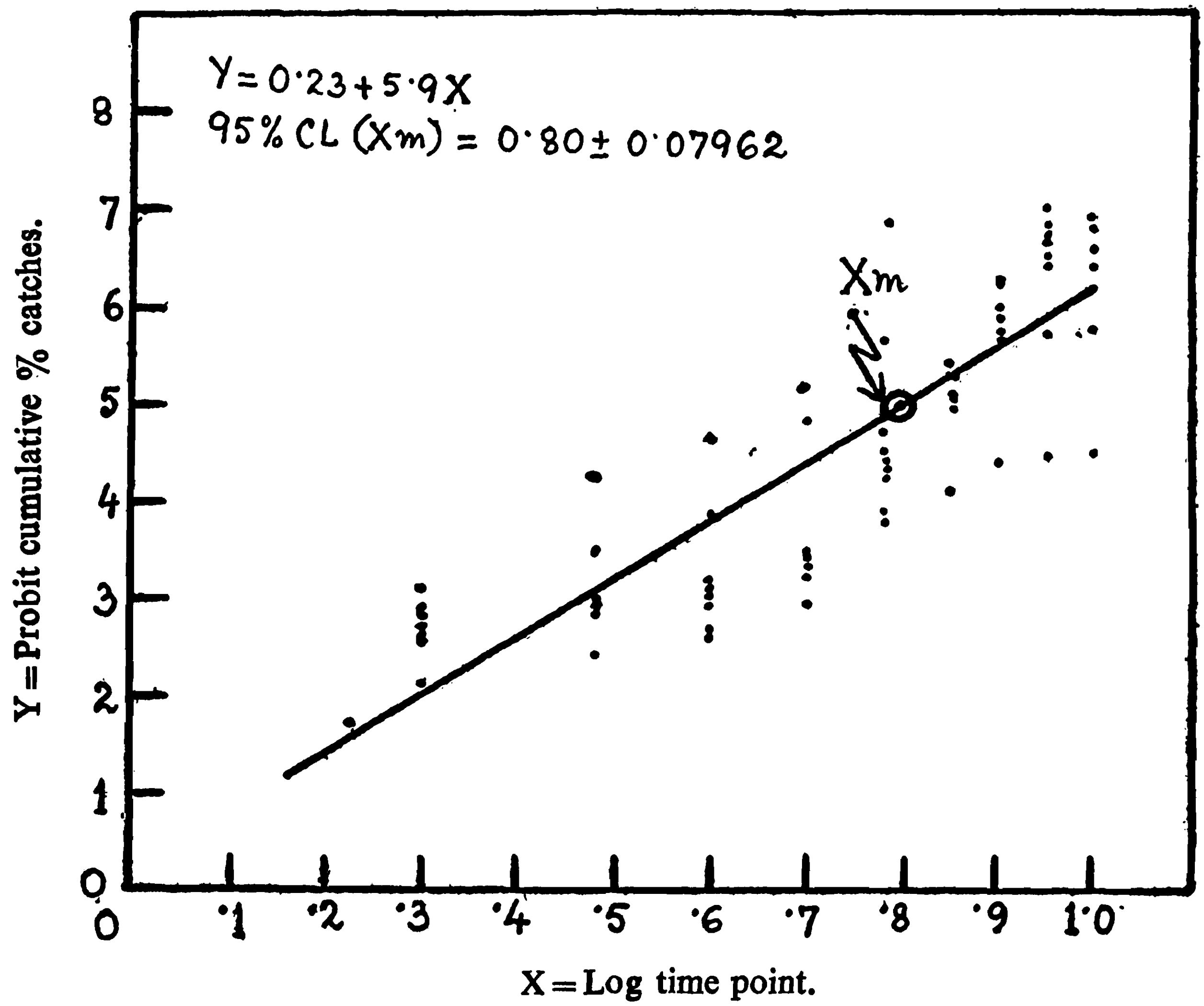

Fig. 2 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of winter hibernating first brood (February, 15±6 days).

predictive purpose is concerned, particularly when the analyses of the catch data are made in deterministic model. Thus, Banerjee and Pramanik (1964) presented the data of three years' catches from the Rice Research Station, Chinsurah, with mention of monthly mean catch per night and got only two peaks of occurrence of the rice yellow borer in a year, coinciding with the period of crop maturity during autumn/winter and that of rice growing during summer. Several workers (Banerjee and Pramanik, 1964 ; Nath *et. al.*, 1979 ; Banerjee and Mondal, 1983 ; Banerjee *et. al.*, 1983) integrated the insect catch with some of the weather variables and crop stages, which may elucidate the insect behaviour but can not predict temporal occurrence of the moth having functional relationship with the crop. Present data of light-trapped catches have also been given in deterministic model and showed the variation in size of the catches in

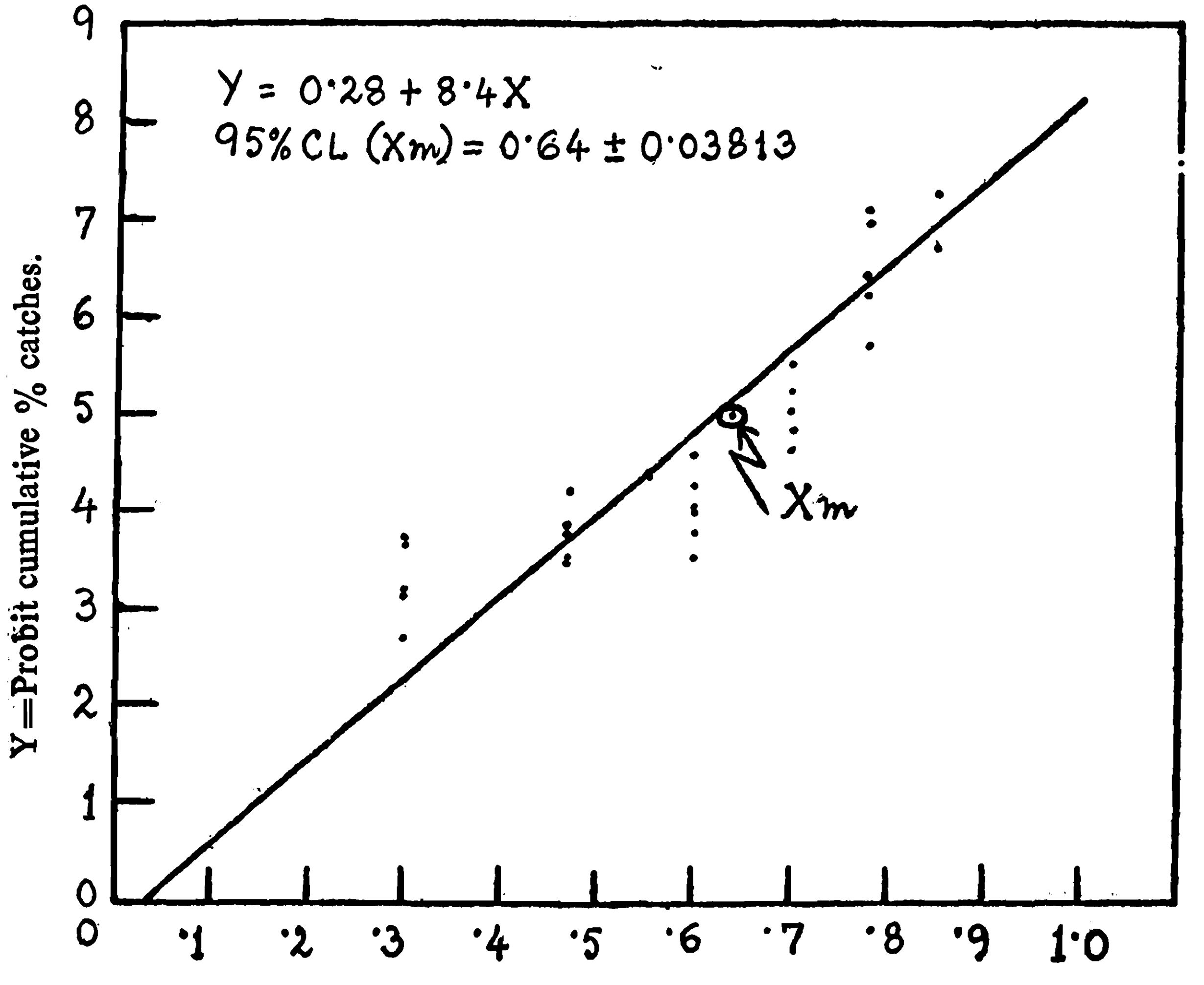

Fig. 3 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of second brood (April, 5±6 days).

different localities with but only two peaks, corresponding to the time of Banerjee and Pramanik (1964). The intermediate peaks, caused by the completion of life-cycle of the borer are, however, not revealed in such representation. Besides, the latter peaks are subduced for their low intensity but have definite role in causing dead-hearts in the vegetative phase of the monsoon crop.

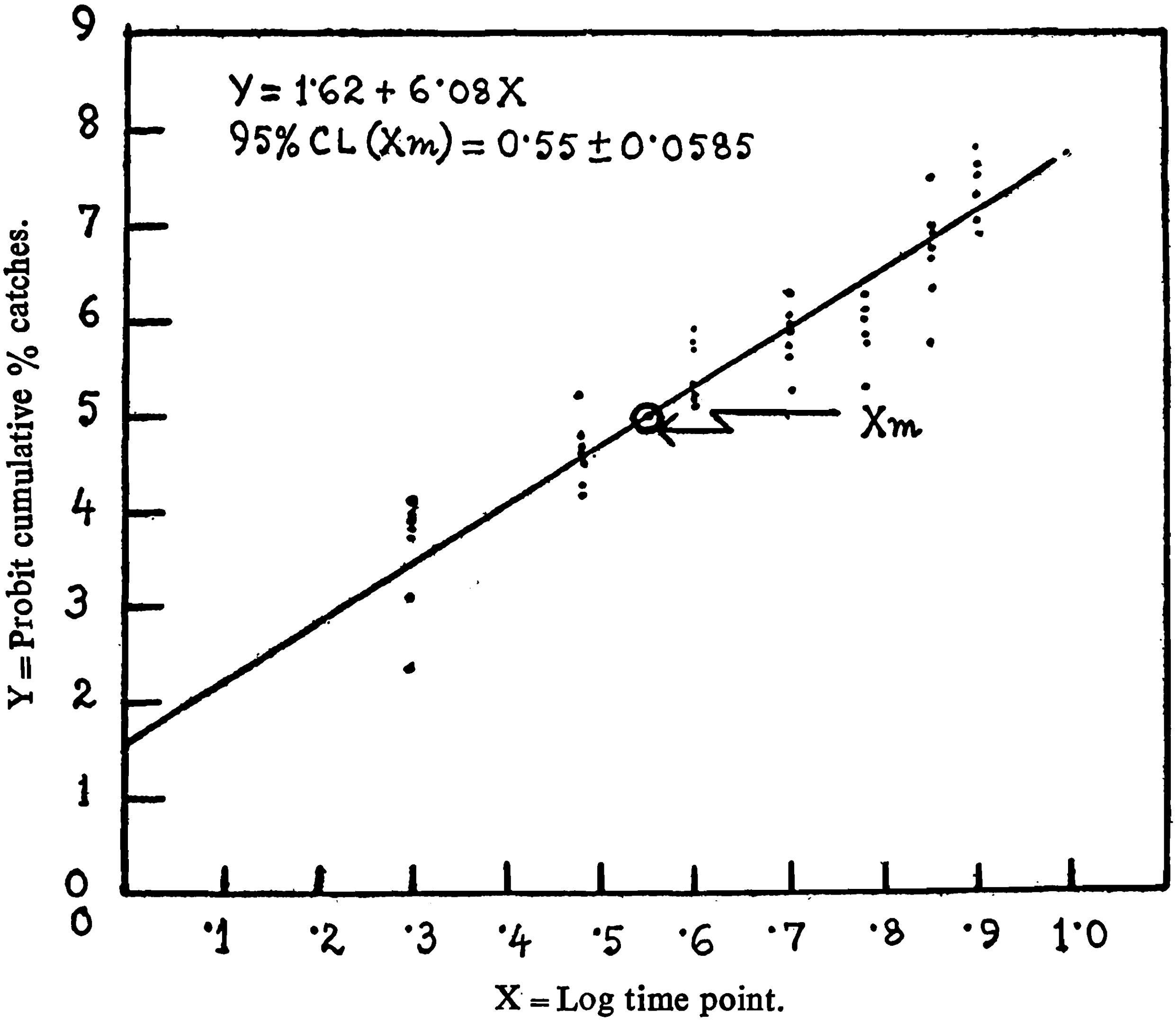

Fig. 4 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of third brood (May, 19±6 days).

When the analysis are made in stochastic model, taking 5 days' catch as unit, the periodical rise and fall of catches are revealed and six broods a year are evident (Figs. 2-7). As the raw catch data are based on removal of moths in every night and considerable overlapping of generations are very common under the weather conditions of West Bengal, such graphical representation of the data nonetheless fails to show the definite peaks of the successive broods—an information urgently needed by the plant protection workers. The Fig. 4, however, shows that the intensity of the brood during dry season is very low when there is scarcity of food and shelter in these saline tracts, with only single harvest a year. On the contrary, there is a many fold increase of successive broods during monsoon, which is a cropping season in these areas. Wide variations are observed in the size of catches between the farms near and away from the coast, which may be due to the effect of noon-humidity (Nath *et. al.* 1979).

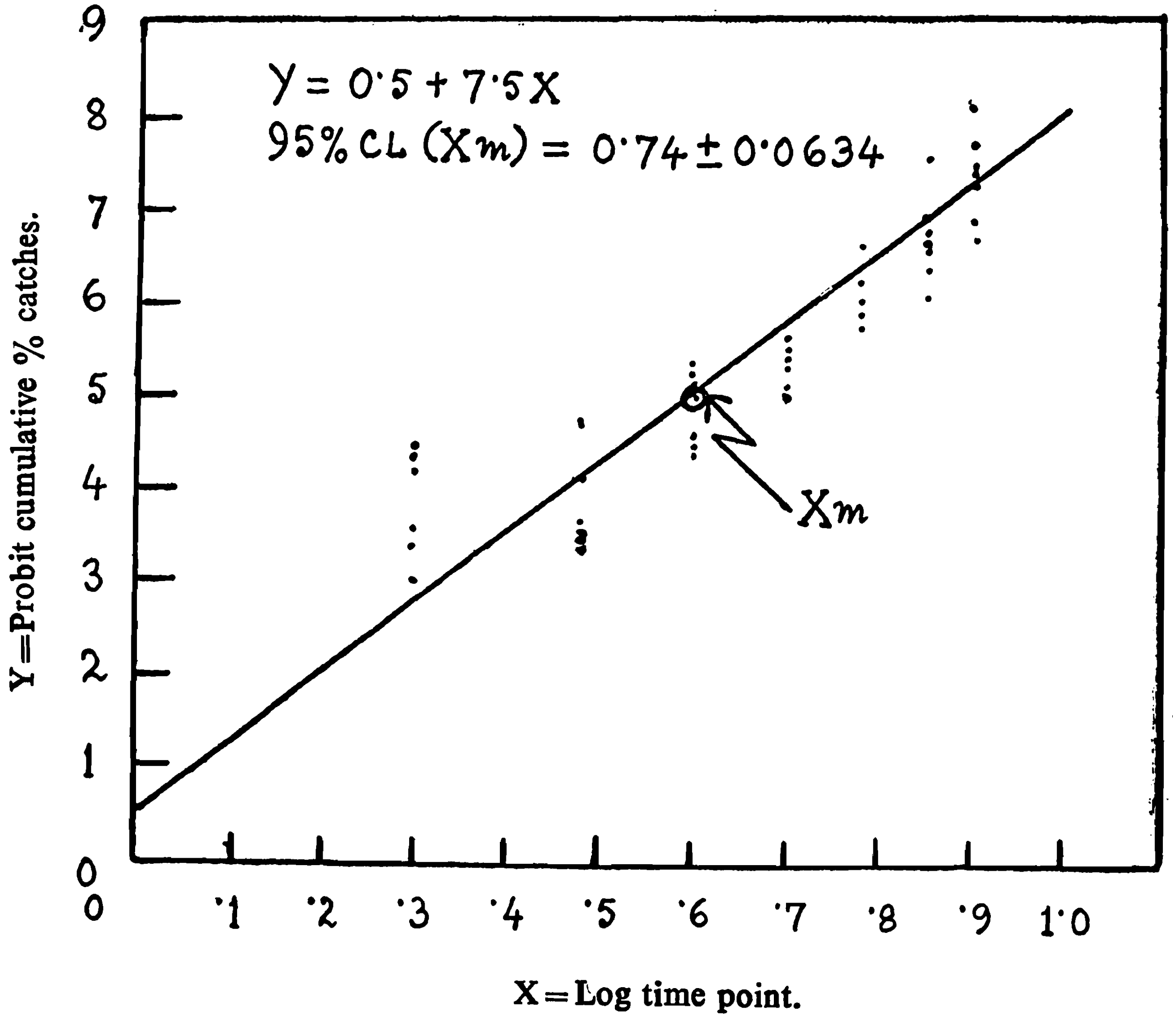

Fig. 5 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of fourth brood (July, 7±6 days).

Nath and Sen (1978), Nath and Banerjee (1984) suggested the application of the probit analysis of the light-trapped catch data for the occurrence prediction of the phototropic insects of field crops in the tropical countries. Practice of such an analysis is in vogue in Japan (Torii, 1964). On the basis of such analysis, Nath *et. al.* (1978), Nath and Sen (1979) got six annual peaks of occurrence of the rice yellow borer from the studies of ten years' light-trapped catch data and two years' insect rearing data at the Rice Rescarah Station, Chinsurah. Same probit analysis is made in the present study and the results are given. The knowledge on the definite peaks of occurrence of the moth during different stages of crop growth will help in timing the operation of pest surveillance, chemical control or releasing of egg-parasitoids for effective regulation in the fields. Though the rice agro-ecological conditions of Chinsurah (Gangetic alluvial tract) and those of the saline tracts are different, the temporal distribution of moths is more or less same, thus

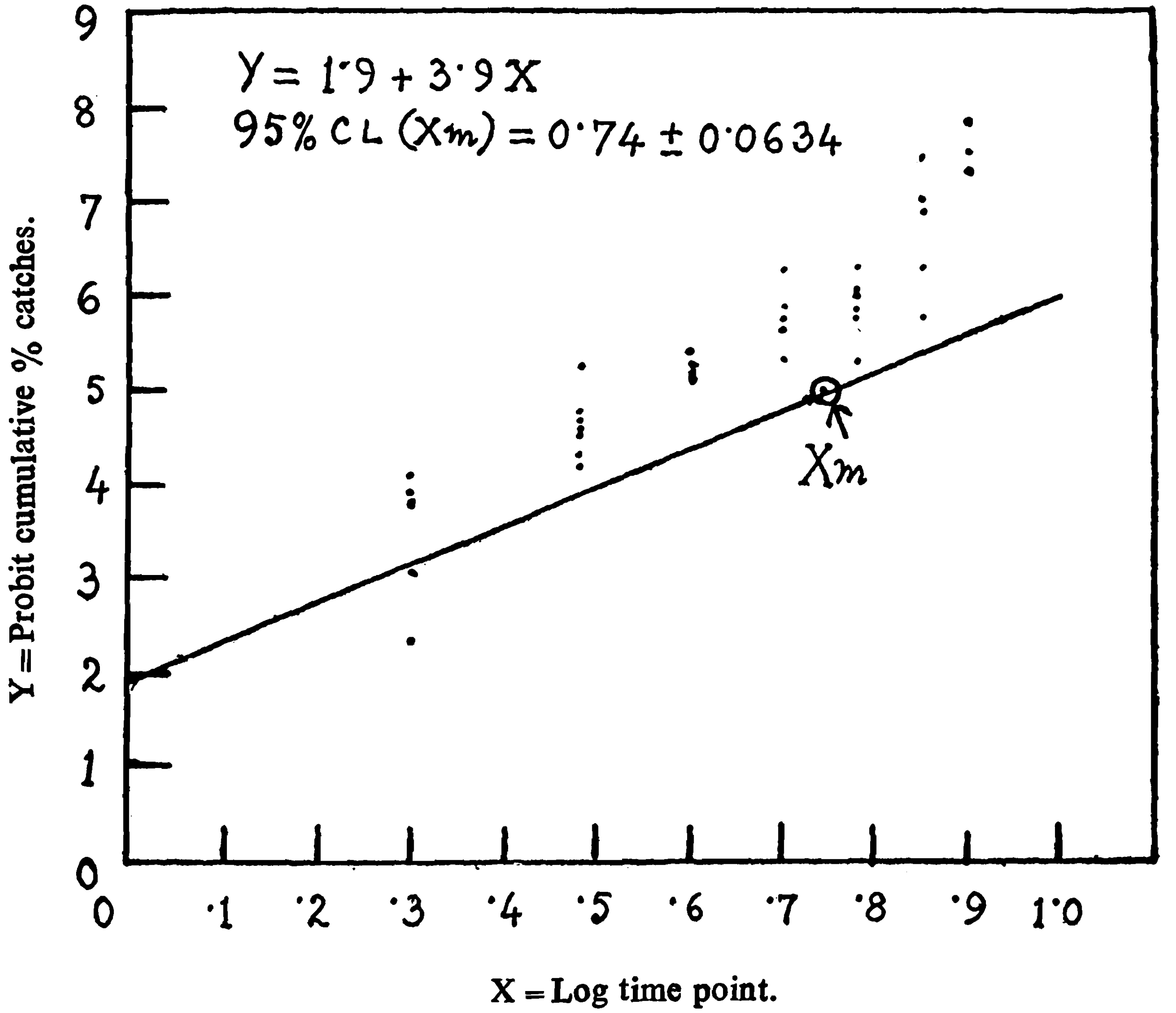

Fig. 6 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of fifth brood (August, 27±6 days).

signifying the greater importance of the seasonality of the life-cycles of the insect rather than the edapic factors for occurrence prediction in warm humid regions. It is also interesting to note that in spite of pooling the data from widely separated localities, there is no heterogeneity [χ_0^2, (Chi) not significant], suggesting thereby linear response of the probit cumulative percentage catches to the time for all the broods.

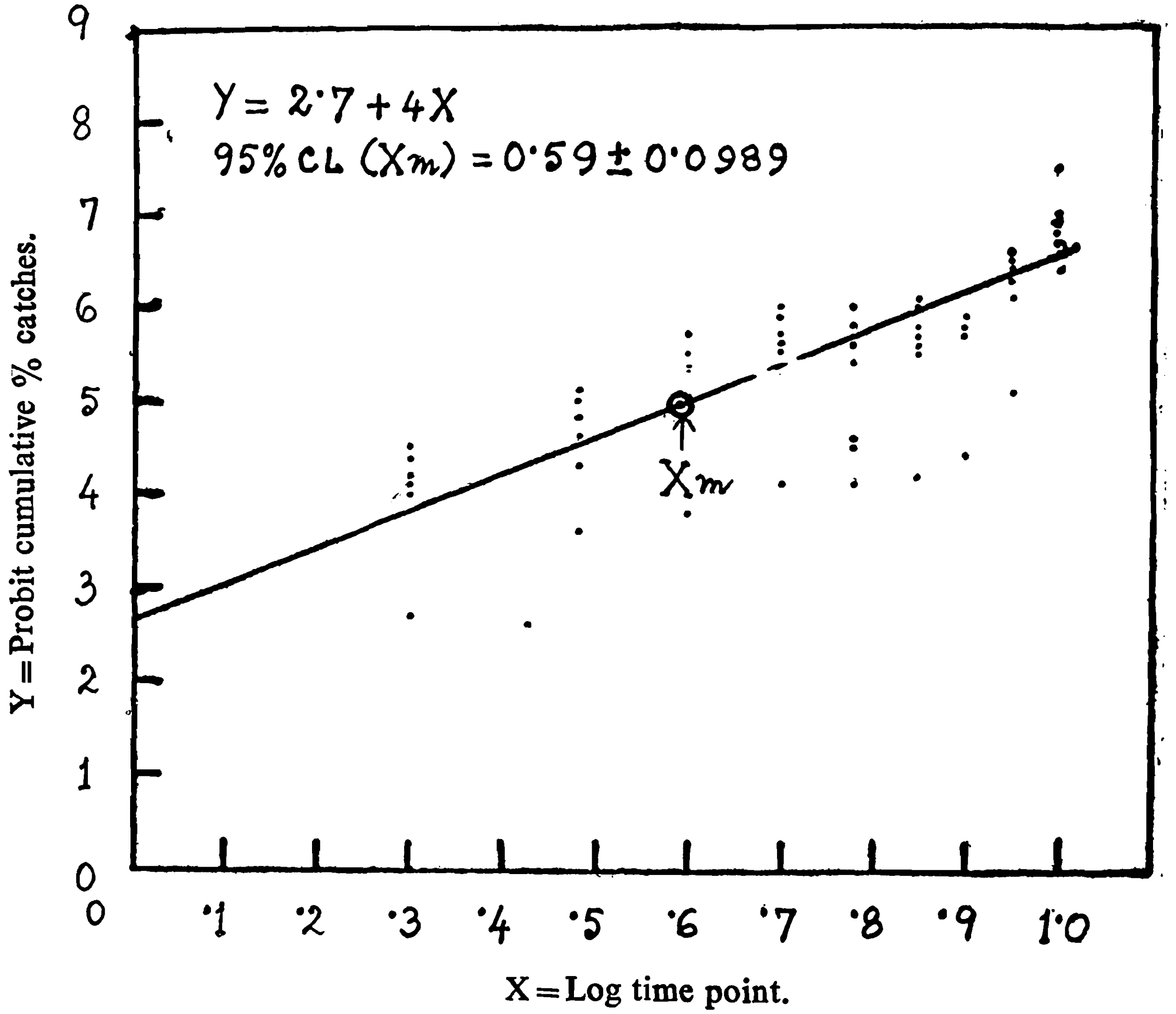

Fig. 7 : Scatter diagram, regression equation and the peak emergence (Xm) of trapped moths of sixth brood (October, 16±6 days).

SUMMARY

Light-trapped catches of adults of the rice yellow borer, *Tryporyza incertulas* (Walker) have been studied for a year from 5 different agricultural farms of the saline tracts of West Bengal. These farms are Baruipur, Diamond Harbour and Sagar of South

24-Parganas, Bagnan of Howrah and Contai of Midnapur districts. The traps have been operated daily from dusk to dawn. The data have been analysed by stochastically considering time point as 5 days-unit. The step-wise analysis of the data for the first brood, as an example, has been furnished in details for occurrence prediction. The result has confirmed the occurrence of six active annual broods of the borer having different intensities. The intensity of the broods during dry season is very low due to the scarcity of food and shelter in these saline tracts, having only one rice crop in a year. On the contrary, there is a many-fold increase in numbers of successive broods of the moth during monsoon, the typical cropping season in these areas. The temporal distribution of the moth is more or less same as at Chinsurah (Gangetic alluvial tract) as at other areas (saline tracts) monitored and there is no heterogeneity among the pooled data of widely separated localities (X^2_0, not significant), thus suggesting the linear response of the probit cumulative percentage catches to the time point for all the broods.

ACKNOWLEDGEMENT

The authors are very much grateful to Late B. K. Bera, Ex-Entomologist, West Bengal, for his pioneering work in this line, unceasing guidance and inspiration which ultimately lead to the completion of this work.

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* **Original not seen, only abstract consulated in Torri (1964).**

Rec. zool. Surv. India, 94 (1) : 87-92, 1994

TWO NEW SPECIES OF DORYLAIMIDA (NEMATODA) FROM KASHMIR VALLEY, INDIA

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INTRODUCTION

During a survey of Kashmir Valley, large number of soil samples were collected from around roots of vegetables and fruit trees. These yielded several nematode species belonging to different groups. The present paper deals with two new species of Dorylaimida, one of which belongs to the genus *Lordellonema* Andrassy, 1960 (Qudsianematidae : Dorylaimoidea) and the second to the genus *Paravulvus* Heyns, 1968 (Nygolaimidae : Nygolaimoidea).

MATERIALS AND METHODS

The nematodes were killed and fixed in hot 4% formalin and processed to glycerine by slow method. The measurements were taken and observation made on specimens mounted in anhydrous glycerine.

Lordellonema bashirensis n. sp.

Dimensions :

Paratype females (2) : L=1·2-1·3 mm ; a=29-33 ; b=4·0-4·3 ; c=41-53 ; c′=0·95-1·1 ; V=49-51 ; G_1=5-6 ; G_2=5-7 ; Odontostyle=15-18 µm ; Odontophore=22·5 µm ; Oesophagus=304-311 µm ; Prerectum=55-64 µm ; Rectum=18-19 µm ; Tail=25-30 µm ; ABD=26-27 µm.

Holotype female : L = 1·3 mm ; a = 33 ; b = 4·0 ; c = 52 ; $c' = 0{\cdot}85$; V = 49 ; $G_1 = 5$; $G_2 = 5$; Odontostyle = 18 µm ; Odontophore = 22·5 µm ; Oesophagus = 310 µm ; Prerectum 65 µm ; Rectum = 18 µm ; Tail = 25·5 µm ; ABD = 30 µm.

Description : Body slender slightly curved upon fixation. Cuticle smooth, 1·5 µm thick at midbody and 2-3 µm at tail. Subcuticle fine ; body pores visible all over the body, 50-56 on ventral side and 30-40 on dorsal side. Lateral chords about 1/4th of body-width at midbody.

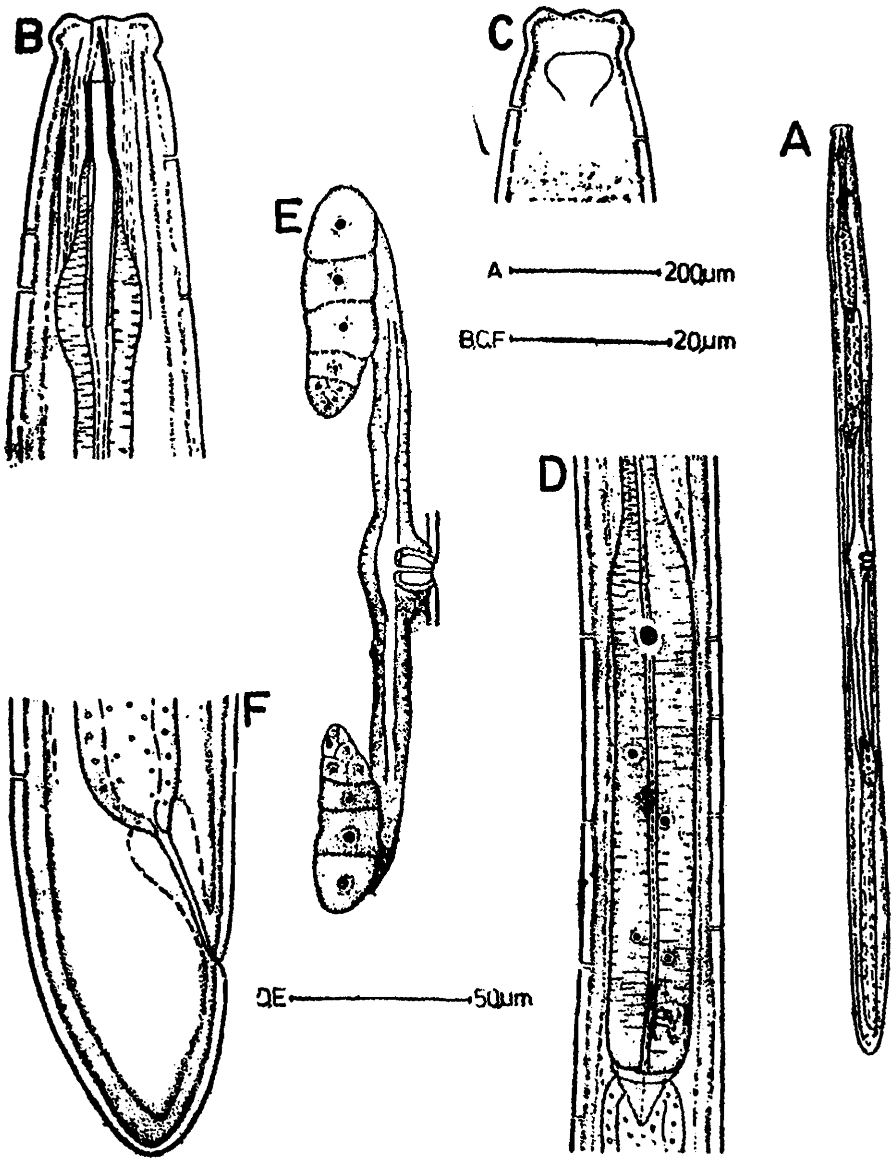

Fig. 1 : *Lordellonema bashirensis* n. sp
A, Entire female ; B, Anterior region ; C, Anterior region showing Amphids ; D, Female gonad.

Lip region offset, 11-12 μm wide and 6-7 μm high. Amphids stirrup-shaped with aperture 7·5 μm or slightly more than half of lip region width. Odontostyle about 1·3-1·5 lip region-widths long with wide lumen and aperture. Odontoplore simple rod-like, about 1·5 times the odontostyle length. Guiding ring single, 9-10 μm or 0·8 lip region-width from anterior end. Expanded part of oesophagus 114-150 μm or about 37-49% of total oesophageal length. Cardia conoid, 10·5 μm or about 1/4th of the corresponding body-width. Cardiac disc present. Oesophageal gland nuclei and orifice located as follows:

DO = 54-56 S_1N_1 = 74-78 S_2N = 89-90
DN = 58-60 S_1N_2 = 78-80 S_2O = 90-92
DO-DN = 4·1-4·5

Female reproductive system amphidelphic. Vulva transverse. Vagina half or more corresponding body-width long. Prerectum 2·0-2·4 anal body-width long. Rectum about 0·6-0·7 anal body width long. Tail short conoid, 0·9-1·1 anal body-width long. 3-4 pairs of caudal pore present.

Male: Not found.

Type habitat and locality:

Soil around roots of Soyabeans (*Glycine max*) from Safapora, Kashmir.

Type material:

Collected in June 1988; holotype female on slide *Lordellonema bashirensis* n. sp./1; paratype females on slide *Lordellonema bashirensis* n. sp/2-3; deposited in nematode Collection of Zoology Department, Aligarh Muslim University, Aligarh. A paratype female deposited with National Zoology Collection, Zoological Survey of India, Calcutta.

Differential diagnosis:

Lordellonema bashirensis n. sp. comes close to *L. parvum* Thorne, 1974; *L. porosum* Heyns, 1963; *L. annulata* Jairajpuri, 1966. It differs from *L. parvum* in having differently shaped lip region, amphids and vulva; slightly longer odontostyle, anterior position of vulva and more number of body pores (lip region angular, amphids duplex, vulva with four lip-like asymmetrical labia, odontostyle=15 μm; V=59; and body pores 30 in *L. parvum*). From *L. porosum* and *L. annulata* it differs in having a longer body, less 'V' value and shorter tail (L=0·55-0·59 mm; V=58-61; c=26-27 in *L. porosum* and L=0·62-0·75 mm; V=65; c=25 in *L. annulata*). It further differs from *L. porosum* in having a longer odontostyle and from *L. annulata* in having amphidelphic gonads (odontostyle=12-13 μm in *L. porosum*, gonad prodelphic in *L. annulata*).

Paravulvus confusus n. sp.

Dimensions :

Paratype female (3) L=1·18-1·42 mm ; a=31-39 ; b=4·1-4·8 ; c=25-35 ; c = 1-3 ; V=44-47 ; G_1=9-13 ; G_2=10-14 ; Tooth=7·5-10·0 μm ; Oesophagus=254-304 μm ; Prerectum=39-45 μm ; Rectum=16-19 μm ; Tail=31-54 μm ; ABD=18-26 μm.

Holotype female : L=1·3 mm ; a=31 ; b=4·2 ; c=24 ; c′=2·4 ; V=44 ; G_1 =13 ; Tooth=7·5 μm ; Oesophagus=304 μm ; Prerectum=42 μm ; Rectum=22 μm ; Tail=54 μm ; ABD=20 μm.

Descriptions :

Body ventrally curved upon fixation. Cuticle 1·5 μm thick at midbody and 2-3 μm at tail tip. Lateral hypodermal chords about 1/3rd of body-width at mid body.

Lip region angular, set off from body contour, 9-11 μm wide and 4·5 μm high. Amphids cup-shaped, their apertures slit-like, 3-6 μm or about half of lip region width. Mural tooth deltoid, 7·5-10·0 μm or 0·5-0·8 lip region width long. Expanded part of oesophagus 133-145 μm or about 52% of oesophageal length, enclosed in a thin muscular sheath. Nerve ring at 82-105 μm from anterior end. Cardia short, 9-10 μm or about 0·2-0·3 of corresponding body width long. Cardiac glands rounded, well developed. Oesophageal gland nuclei and their orifice are located as follows :

DO =50-53
DN =52-55
DO-DN =2·0-2·4
S_1N_1=64-67
S_1N_2=66-70
S_2N=87-92
S_2O=85-90

Female reproductive system amphidelphic. Vulva longitudinal. Vagina narrow, about 1/3-1/2 of corresponding body width long. Sphincter distinct at oviduct-uterus junction. Prerectum about 2-3 anal body widths long. Rectum about one anal body-width long. Tail elongate conoid, ventrally curved, 1-3 anal body-width long, with a pair of caudal pores on each side.

Males : Not found.

Type habitat and locality :

Soil around the roots of *Solanum melongena* L. from Baramulla, Kashmir.

Type materials :

Collected in April 1988 ; holotype female on slide *Paravulvus confusus* n. sp./1 ; Paratype females on slides *Paravulvus confusus* n. sp./2-3. Deposited in nematode collection of Zoology Department, Aligarh Muslim University, Aligarh. A paratype female deposited with National Zoological Collection, Zoological Survey of India, Calcutta.

Differential diagnosis :

Paravulvus confusus n. sp. is distinctive in the genus because of the absence of paravulvae and the subdorsal organ at oesophagus base. However, in other characters it comes close to *P. acuticaudatus* (Thorne, 1930) Thorne, 1974 and *P. hartingii* (de Man, 1880) Thorne, 1974. From the former it differs in having slightly shorter body, differently

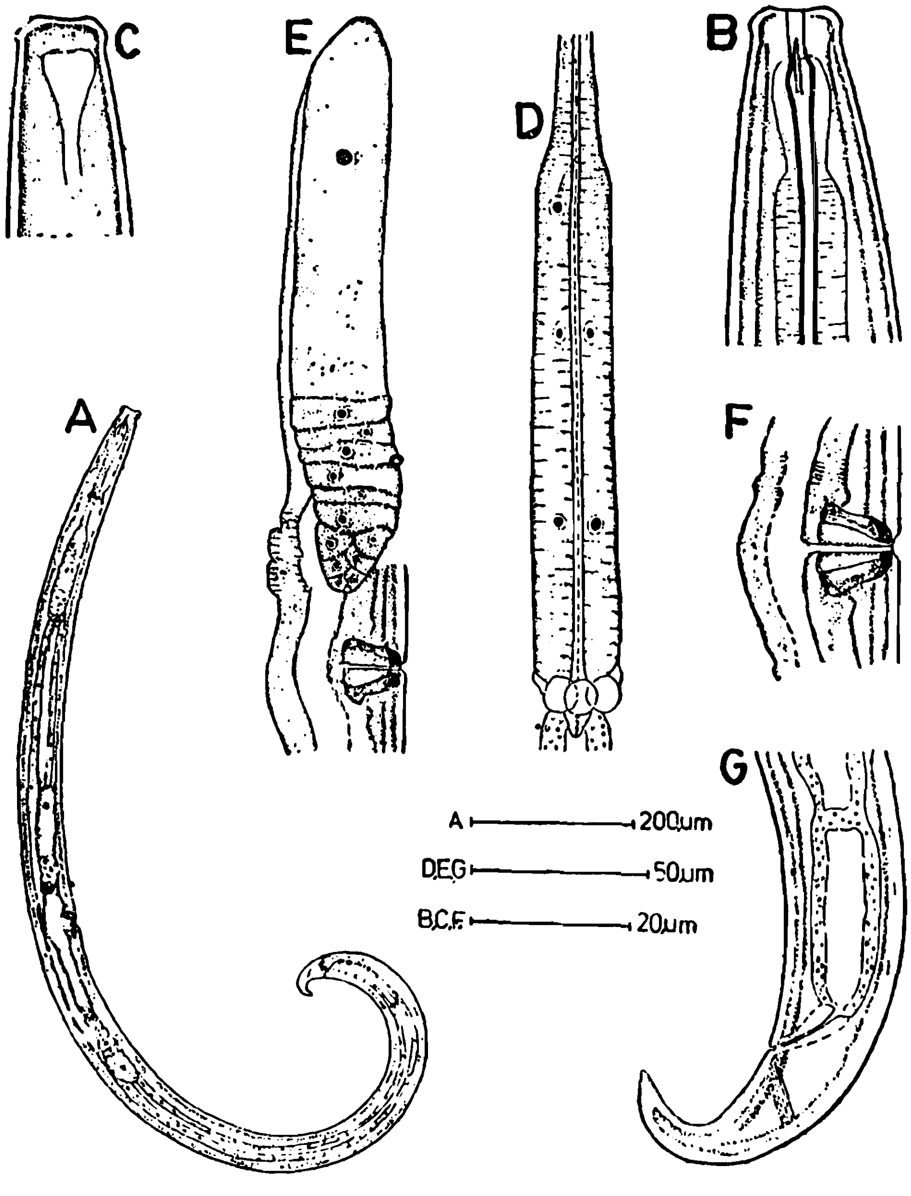

Fig. 2 : *Paravulvus Confusus* n. sp.
A, Anterior region ; B, Anterior region ; C, Anterior region showing Amphid ; D, Expanded oesophageal region ; E, Female genital branch (anterior) ; F. Vulval region ; G, Posterior end.

shaped lip region and less c value (L = 1·55-1·87 mm ; c = 49-53). From *P. hartingli* it differs in the shape of lip region, wider amphidial fovea and in the shape of vaginal sclerotization (lip region continous with body contour, amphidial fovea about 1/3rd of lip region width and vaginal sclerotization weakly developed in *P. hartingii*).

SUMMARY

Two new species of dorylaim nematode, one each belonging to the genus *Lordellonama* Andrassy, 1960 (Family Qudsianematidae Jairajpuri, 1965) and *Paravulvus* Heyns, 1968 (Family Nygolamidae Thorne, 1935) are described and illustrated. *Lordellonema bashirensis* n. sp. has 1·2-1·3·mm long body, a = 29-33 ; b = 4·0-4·3 ; c = 41-53 ; V = 49-51; odontostyle = 15-18 μm and odontophore 22·5 μm. *Paravulvus confusus* n. sp. has 1·1-1·4 mm long body, a = 31-39 ; b = 4·1-4·8 ; c = 25-35 ; v = 44-47 ; and tooth = 7·5-10·0 μm.

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Rec. zool. Surv. India, 94 (1): 93—98, 1994

NEW RECORDS OF SARCOPHAGID FLIES (DIPTERA : SARCOPHAGIDAE) FROM NAGALAND, INDIA

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INTRODUCTION

Nothing is known regarding the Sarcophagid flies from Nagaland. The author collected these flies from different parts of Nagaland in 1989 and a total of nineteen species are recorded for the first time from this Hilly state of India. Distributional records of the species are included if these are not mentioned in my earlier papers (in press).

SYSTEMATIC ACOOUNT

Subfamily : SARCOPHAGINAE
Tibia : SARCOPHAGINI
Subtribe : PARASARCOPHAGINA

1. **Bercaea haemorrhoidalis** (Fallén)

1816. *Musca haemorrhoidalis* Fallén, *Vetensk. Akad. Handl.* : 236.
1989. *Bercaea haemorrhoidalis* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 23.

Material : 1 ♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989.

2. **Boettcherisca** (s. str.) **peregrina** (Robineau-Desvoidy)

1830. *Myophora peregrina* Robineau-Desvoidy, *Essai. Myodaires*, 1 : 356.
1989. *Boettcherisca (s. str.) peregrina* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 23.

Material ; 1 ♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989.

3. Lioproctia (Coonoria) pattoni (Senior-White)

1924. *Sarcophaga pattoni* Senior-White, *Rec. Indian Mus.*, 26 (3) : 242.
1977. *Lioproctia (Coonoria) pattoni* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Oriental Region*, 3 : 567.

Material : 1 ♂, Nagaland ; Mokokchung Circuit House Campus, 1,325 m., 27.x.1989.

Distribution ; India (Nagaland, Tamil Nadu) ; Formosa ; South China ; Viet Nam.

4. Parasarcophaga (Liopygia) ruficornis (Fabricius)

1794. *Musca ruficornis* Fabricius, *Ent. Syst.*, 4 : 314.
1989. *Parasarcophaga (Liopygia) ruficornis* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 24.

Material : 3♂♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989 ; 1 ♂, Kohima Science College Campus, 1,495 m., 21.x.1989.

5. Parasarcophaga (Liosarcophaga) brevicornis (HO)

1934. *Sarcophaga brevicornis* HO, *Bull. Fan. Mem. Inst. Biol.*, 5 (1) : 23.
1989. *Parasarcophaga (Liosarcophaga) brevicornis* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 24.

Material : 2♂♂, Nagaland ; Kohima Zoological Park, 1,495 m., 21.x.1989 ; 1 ♂, Kohima Science Campus, 1,495 m., 21.x.1989 ; 1 ♂, Dimapur Hospital Campus, 195 m., 23.x.1989.

6. Parasarcophaga (Liosarcophaga) dux (Thomson)

1868. *Sarcophaga dux* Thomson, *Kongl. Seven. Freg. Eugen. Resa.*, p. 534.
1988. *Parasarcophaga (Liosarcophaga) dux* : Nandi, *J. Bengal nat. Hist. Soc.*, 7 (2) : 14.

Material : 3 ♂♂, Nagaland ; Dimapur Circuit House Campus, 195 m., 23.x.1989.

7. Parasarcophaga (Liosarcophaga) jaipurensis Nandi

Parasarcophaga (Liosarcophaga) jaipurensis Nandi, *J. Bengal nat. Hist. Soc.*, (in press).

Material : 1 ♂, Nagaland ; Tuensang Circuit House Campus, 1,371 m., 26.x.1989.

Distribution : India (Haryana, Himachal Pradesh, Nagaland and Rajasthan).

8. **Parasarcophaga (Liosarcophaga) scopariformes** (Senior-White)

1927. *Sarcophaga scopariformes* Senior-White, *Spolia zeylan.*, 14 : 82.
1982. *Parasarcophaga (Liosarcophaga) scopariformes* : Nandi, *Rec. zool. Surv. India*, 80 : 119.

Material : 3♂♂, Nagaland ; Dimapur Hospital Campus, 195 m., 23.x.1989.

Distribution : India (Assam, Manipur, Nagaland, West Bengal) ; China ; Hainan Island ; Laos ; Sri Lanka.

9. **Parasarcophaga (s. str.) albiceps** (Meigen)

1825. *Sarcophaga albiceps* Meigen, *Syst. Beschr.*, 5 : 22.
1989. *Parasarcophaga (s. str.) albiceps* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 23.

Material : 6♂♂, Nagaland ; Dimapur War Cemetery Campus, 1,490 m., 22.x.1989 ; 14♂♂, Tuensang Circuit House Campus, 1,371 m., 26.x.1989 ; 2♂♂, Mokokchung Circuit House Campus, 1,325 m., 27.x.1989 ; 2♂♂, Kohima Science College Campus, 1,495 m., 21.x.1989.

10. **Parasarcophaga (s. str.) knabi** (Parker)

1917. *Sarcophaga knabi* Parker, *Proc. U. S. natn. Mus.*, 54 : 96.
1989. *Parasarcophaga (s. str.) knabi* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 24.

Material : 1♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989 ; 4♂♂, Dimapur Hospital Campus, 195 m., 23.x.1989.

11. **Parasarcophaga (s. str.) macroauriculata** (HO)

1932. *Sarcophaga macroauriculata* HO, *Bull. Fan. Mem. Inst. Biol.*, 3 : 347.
1982. *Parasarcophaga (s. str.) macroauriculata* : Nandi, *Rec. zool. Surv. India*, 79 : 459.

Material : 1♂, Nagaland ; Dimapur Hospital Campus, 195 m., 23.x.1989.

12. **Parasarcophaga (s. str.) orchidea** (Böettcher)

1913. *Sarcophaga orchidea* Böettcher, *Annls Hist. nat. Mus. Natn. hung.*, 11 : 375.
1989. *Parasarcophaga (s. str.) orchidea* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 24.

Material : 1♂, Nagaland ; Kohima Zoological Park, 1,495 m., 21.x.1989 ; 4♂♂, Dimapur Hospital Campus, 195 m., 23.x.1989 ; 3♂♂, Dimapur Circuit House Campus, 195 m., 23.x.1989.

13. **Robineauella (Jantiella) coei** (Rohdendorf)

1966. *Robineuella* (*Jantiella*) *coei* Rohdendorf, *Bull. Brit. Mus.* (*Nat. Hist.*) *Ent.*, 17 (10) : 458.
1976. *Robineuella* (*Jantiella*) *coei* : Nandi, *Rev. Brasil Biol.*, 36 (4) : 920.

Material : 1♂, Nagaland ; Mokokchung Circuit House Campus, 1,325 m., 27.x.1989.

14. **Rosellea khasiensis** (Senior-White)

1924. *Sarcophaga khasiensis* Senior-White, *Rec. Indian Mus.*, 26 (3) : 246.
1977. *Rosellea khasiensis* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Oriental Region*, 3 : 574.

Material : 1♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989.

Distribution : India (Kashmir, Meghalaya, Nagaland, Sikkim) ; Nepal.

15. **Sarcorohdendorfia pusana** (Senior-White)

1924. *Sarcophaga pusana* Senior-White, *Rec. Indian Mus.*, 26 (3) : 245.
1977. *Sarcorohdendorfia pusana* : Lopes, Kano, Shinonaga and Kurahashi, *Cat. Dipt. Oriental Region*, 3 : 574.

Material : 1♂, Nagaland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989.

Subtribe : HELICOPHAGELLINA

16. **Pierretia (Ascelotella) calicifera** (Böettcher)

1912. *Sarcophaga calicifera* Böettcher, *Ent. Mitt.*, 1 : 169.
1988. *Pierretia* (*Ascelotella*) *calicifera* : Nandi, *J. Bengal nat. Hist. Soc.*, 7 (2) : 21.

Material : 1♂, Nagaland ; Mokokchung Circuit House Campus, 1,325 m., 27.x.1989.

Subtribe : HARPAGOPHALLINA

17. **Harpagophalla kempi** (Senior-White)

1924. *Sarcophaga kempi* Senior-White, *Rec. Indian Mus.*, 26 (3) : 247.
1988. *Harpagophalla kempi* : Nandi, *J. Bengal nat. Hist. Soc.*, 7 (2) : 18.

Material : 3♂♂, Nagaland ; Dimapur Hospital Campus, 195 m., 23.x.1989.

18. **Iranihindia martellata** (Senior-White)

1924. *Sarcophaga martellata* Senior-White, *Rec. Indian Mus.*, 26 (3) : 247.
1988. *Iranihindia martellata* : Nandi, *J. Bengal nat. Hist. Soc.*, 7 (2) : 18.

Material : 1♂, Nagaland ; Dimapur Hospital Campus, 195 m., 23.x.1989.

Subtribe : SENIORWHITEINA

19. **Seniorwhitea krameri** (Böettcher)

1912. *Sarcophaga krameri* Böettcher, *Ent. Mitt.*, 1 : 166.
1989. *Seniorwhitea krameri* : Nandi, *J. Bengal nat. Hist. Soc.*, 8 (1) : 29.

Material : 2♂♂, Nagland ; Kohima War Cemetery Campus, 1,490 m., 22.x.1989 ; 1♂, Dimapur Hospital Campus, 195 m., 23.x.1989 ; 1♂, Mokokchung Circuit House Campus, 1,325 m., 27.x.1989.

SUMMARY

Nineteen species under eleven genera treated here are recorded for the first time from Nagaland, India.

ACKNOWLEDGEMENTS

I am thankful to the Director, Zoological Survey of India, Calcutta, for permission and financial help to work on this group under Collaborative Research Project and Contractual Services in Z. S. I. and the Principal, Krishnanagar Government College for help during research period.

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Rec. Zool. Surv. India, 94 (1) : 99-111, 1994

A PRELIMINARY ACCOUNT ON THE FISH FAUNA OF THE ESTUARIES OF GANJAM DISTRICT, ORISSA

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INTRODUCTION

Estuarine fish fauna exhibit enormous diversity in their morphology and form an important constituent of our coastal ecosystem as well as the economy of a maritime country like India. A proper knowledge of their availability in our estuaries is a prerequisite for the successful development of estuarine fisheries and their conservation as man's recent increasing modification of this environment causes disturbance or threats for their decline. Estuarine fish fauna have been studied by Chacko *et al.*, 1954 ; Thampi, 1959 ; Rao, 1964 ; Shetty *et al.*, 1965 ; Mahapatra, 1966 ; Tilak, 1969 ; Gopalakrishnan, 1973 ; Raman & Patnaik, 1976 ; Silas *et al.*, 1980 ; Nair *et al.*, 1983, 1984 ; Rama Rao *et al.*, 1992 to a greater extent. However, there is no published information or rather sporadic information on fish fauna from estuaries of Ganjam District. It is, therefore, attempted in this investigation to identify all the fishes occurring in estuaries and creek of this district. The present communication is the first report on the fish fauna of estuarine water bodies of this district.

Ganjam District is one of the four maritime districts situated (18°46′-20°17′ N to 83°48′-85°11′ E) in the southern part of Orissa. Within its 60 kms. of coastline, about 3000 hectores of estuarine habitats i.e. the Rushikulya (19°22′-19°27′ N and 85°02′-85°05′ E), the Bahuda (19°5′-19°10′ N and 84°45′-84°50′ E) and the Gopalpur creek (19°15′-19°21′ N and 84°54′-84°56′ E) (Fig. 1) open into the Bay of Bengal on a narrow continental shelf subjecting tidal influence to these coastal water bodies.

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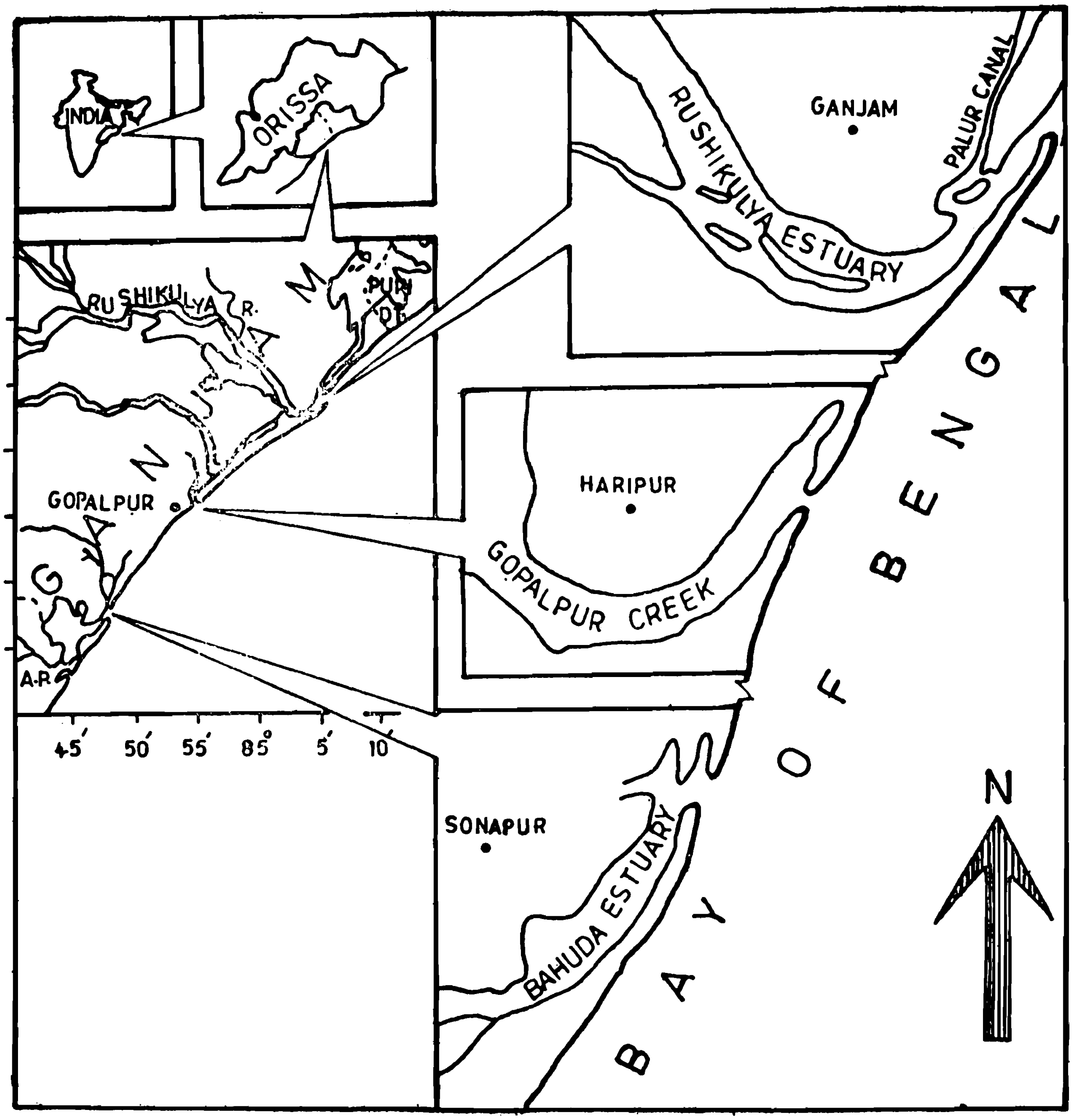

FIG. 1:- LOCATION MAP OF STUDY AREA

MATERIALS and METHODS

A number of local surveys have been carried out during the years 1980-1986 to the Rushikulya estuary, Gopalpur creek and Bahuda estuary. The fish specimens were collected from the cast nets and seine nets used commonly. The representative samples of fishes were duly preserved in 10% formalin and identification were carried out following Day, 1889 ; Munro, 1955 ; Fischer & Bianchi, 1984 ; Fischer & Whitehead, 1974 ; Jayaram, 1981 ; Talwar & Kacker, 1984 ; Khora, 1986, 1992 and 1993. The classification adopted is after Nelson (1984) with a few deviations based on results of the recent works. All the examined samples are deposited in the National Zoological Collections maintained at Estuarine Biological Station, Zoological Survey of India, Berhampur, Orissa after identification.

RESULTS and DISCUSSIONS

The present qualitative analysis based on collection and observation of representative samples of fishes revealed a wealth of varieties of fish fauna inhabiting the estuarine ecosystem of the Ganjam District, Orissa. A total of 70 species belonging to 12 orders, 14 suborders, 39 families, 8 subfamilies and 52 genera are recorded in this study. Up-to-date systematic accounts and scientific names with authority, equivalent English names, the local Oriya name (s), full details of the species occurrence, and their economic importance have been presented in Table-1. Of the 70 species recorded, 2 are chondrichthyes (cartilaginous fishes) belonging to order Rajiformes and family Dasyatidae (stingrays) and the remaining are osteichthyes (bony fishes). Most of the families are represented by one or two species while families which have good representation are Cyprinidae (5 species), Ariidae (4 species), Carangidae (6 species), Mugilidae (4 species) and Gobiidae (4 species). The majority of species are typically marine and some are occassional visitors. The species i.e., *Mystus gulio*, *Platycephalus indicus*, *Ambassis gymnocephalus*, *Sillago sihama*, *Gerres filamentos*, *Mugil cephalus*, *Liza parsia*, *Glossogobius biocellatus*, *Oxyurichthys microlepis* and *Cynoglossus semifasciatus* are found from all these three water bodies. This indicates their wide range of tolerance of physicochemical parameters of these coastal waters. Therefore, these species can be taken up for coastal aquaculture in this region. Presently, the Clupids, Cyprinids, Bagrids, Ariids, Carangids and Mugilids are most common groups contributing substantially to the local capture fisheries. Among the mullets, *Mugil cephalus* and *Liza parsia* are most common and caught round the year. Out of the total species recorded by this study, 38 species have commercial importance.

Table 1. Classified list of fish fauna of the estuaries/creek of Ganjam District (Orissa)

Systematic position of Species	English name	Local name (s)	RE	GC	BE
Grade : PISCES					
Class : CHONDRICHTHYES—cartilaginous fishes					
Subclass : ELASMOBRANCHII					
Order : RAJIFORMES					
Family : DASYATIDAE—stingrays & butterflyrays					
Subfamily : DASYATINAE—stingrays					
1. *Dasyatis jenkinsii* (Annandale)	Sharpnose stingray	Sankucha	—	–	+
2. *Dasyatis uarnak* (Forsskal)	Honeycombed stingray	Sankar	—	—	+
Class : OSTEICHTHYES—bonyfishes					
Subclass : ACTINOPTERYGII—modern bonyfishes					
Order : ELOPIFORMES					
Suborder : ELOPOIDEI					
Family : ELOPIDAE—ladyfishes, tenpounders					
3. *Elops machnata* (Forsskal)*	Tenpounder	Jallungu, Nahana	–	+	+
Order : ANGUILLIFORMES					
Family : OPHICHTHIDAE—snake eels					
4. *Callechelys longipinnis* Kner & Steindachner*	Shorttailed snake eel	Donna	+	+	—
Family : CONGRIDAE—conger eels					
5. *Conger cinereus* Ruppell*	Indian conger eel	Denwa	—	+	-

Note : * Commercially important
RE—Rushikulya Estuary
+ Found — Not found
GC—Gopalpur Creek BE—Bahuda Estuary

Order : CLUPEIFORMES					
Suborder : CLUPEOIDEI					
Family : CLUPEIDAE—sardines, shads					
Subfamily : CLUPEINAE—sardines					
6. *Sardinella fimbriata* (Valenciennes)*	Lesser sardine	Kabala	+	—	—
Subfamily : ALOSINAE—shads					
7. *Hilsa ilisha* (Hamilton-Buchanan)*	Hilsa shad	Ilishi	+	—	—
8. *Hilsa kelee* (Cuvier)	Kelee shad	Pandapila	—	+	+
Family : ENGRAULIDAE—anchovies					
Subfamily : ENGRAULINAE					
9. *Stolephorus commersonii* Lacepede*	Commerson's anchovy	Chwali-patw	+	—	—
10. *Stolephorus indicus* (Van Hasselt)	Indian anchovy	Balikokili	+	—	—
11. *Thryssa malabarica* (Bloch)	Malabar thryssa	Phasa	—	+	+
Order : CYPRINIFORMES					
Family : CYPRINIDAE—minnows & carps					
12. *Esomus danricus* (Hamilton-Buchanan)*	Flying barb	Jhai	—	—	+
13. *Puntius filamentosus* (Valenciennes)*	Blackspot barb	Guldi	—	—	+
14. *Puntius sophore* (Hamilton-Buchanan)*	Common barb	Patia kerandi	—	—	+
15. *Puntius ticto ticto* (Hamilton-Buchanan)*	Tirefin barb	Kudji kerandi	—	—	+
16. *Salmostoma bacaila* (Hamilton-Buchanan)	Chela	Jellarhi	—	+	+
Family : COBITIDAE—loaches					
17. *Lepidocephalus* (*Lepidocephalichthys*) *guntea* (Hamilton-Buchanan)	Lesser loach	Konda-turi, Thora Jupkari	—	—	+
Order : SILURIFORMES					
Family : BAGRIDAE—bagrid catfishes					
18. *Mystus bleekeri* (Day)*	Indian catfish	Kontia, Guntea	—	—	+

19. *Mystus cavasius* (Hamilton-Buchanan)*	Dwarf catfish	Tengra, Kontia	–	–	+
20. *Mystus gulio* (Hamilton-Buchanan)*	Longwhisker catfish	Kontia	+	+	+
Family : ARIIDAE—seacatfishes					
21. *Arius arius* (Hamilton-Buchanan)*	Hamilton's catfish	Singada, Kontia	+	–	–
22. *Arius caelatus* Valenciennes	Engraved catfish	Kontia, Singada	+	–	–
23. *Arius maculatus* (Thunberg)	Spotted catfish	Kontia, Singada	–	–	+
24. *Arius tenuispinis* Day	Day's catfish	Shingada, Kontia	–	–	+
Family : PLOTOSIDAE-catfish eels					
25. *Plotosus lineatus* (Thunberg)	Striped catfish eel	Kamda, Kaunda	–	+	–
Order : CYPRINODONTIFORMES					
Suborder : EXOCOETOIDEI					
Family : HEMIRAMPHIDAE—halfbeaks					
26. *Hyporhamphus xanthopterus* (Valenciennes)*	Redtipped halfbeak	Gania, Gangatur	–	+	–
Family : ORYZIIDAE—topminnow					
27. *Oryzias melastigmus* (McClelland)*	Estuarine topminnow	Kauradia, Kanakuri Bor-ro-guddi	–	+	–
Order : SYNGNATHIFORMES					
Family : SYNGNATHIDAE—seahorse & pipefishes					
28. *Microphis brachyurus* (Bleeker)	Short-tailed pipefish	Balipoka	+	–	–
Order : SCORPAENIFORMES					
Family : APLOACTINIDAE—velvetfishes					
29. *Vespicula niger* (Cuvier)	Black smooth stingfish		–	+	–

Suborder : PLATYCEPHALOIDEI
Family : PLATYCEPHALIDAE—flatheads
Subfamily : PLATYCEPHALINAE

30. *Platycephalus indicus* Linnaeus*	Indian flathead	Tokoro	+	+	+

Order : PERCIFORMES
Suborder : PERCOIDEI

Family : AMBASSIDAE—glassfishes

31. *Ambassis commersoni* Cuvier	Commerson's glassfish	Kokurvi, Pholgrae	–	+	+
32. *Ambassis gymnocephalus* (Lacepede)	Nakedhead glassyperch	Chandee	+	+	+

Family : SERRANIDAE—seabasses, groupers
Subfamily : EPINEPHELINAE

33. *Promicrops lanceolatus* (Bloch)*	Mottled brown seabass	Kolaji	–	+	–

Family : TERAPONIDAE—grunters

34. *Terapon jarbua* (Forsskal)*	Jerbua terapon	Gahana, kora	+	–	+

Family : SILLAGINIDAE—whitings

35. *Sillago sihama* (Forsskal)*	Silver sillago	Toul danti	+	+	+

Family : CARANGIDAE—jacks, kingfishes

36. *Carangoides armatus* (Ruppell)	Longfin cavalla	Tirana	–	–	+
37. *Caranx carangus* (Bloch)	Blacktailed trevally	Konti	+	–	+
38. *Caranx ignobilis* (Forsskal)	Yellowfin jack	Kanto	–	+	+
39. *Megalaspis cordyla* (Linnaeus)*	Hardtail scad	Vorsa	–	+	+
40. *Scomberoides tala* (Cuvier)	Deep queenfish	Kanto	–	+	–
41. *Scomberoides tol* (Cuvier)	Slender queenfish	Khadisa, Parei	–	–	+

Family : LUTJANIDAE—snappers

42. *Lutjanus johni* (Bloch)*	John's snapper	Angarua, Kokarba	+	+	–
43. *Lutjanus kasmira* (Forsskal)*	Bluebanded snapper	Soosta	–	+	–

Family	: LOBOTIDAE– tripletalis					
44.	*Datnioides quadrifascianus* (Sevastianov)	Fourband tripletail	Khuranti	–	+	–
Family	: GERREIDAE—mojarras					
45.	*Gerres filamentosus* Cuvier*	Whipfin mojarra	Jagili	+	+	+
Family	: SPARIDAE—seabreams, porgies					
46.	*Acanthopagrus latus* (Houttuyn)	Yellollowfin seabream	Galamara	–	+	+
Family	: MULLIDAE—goatfishes					
47.	*Upeneus* (*Pennon*) *tragula* (Richardson)	Darkbanded goatfish	Gulibinda	–	+	–
48.	*Upeneus* (*Upeneus*) *sulphureus* Cuvier*	Yellow goatfish	Gulibinda	+	–	–
Family	: SCATOPHAGIDAE—scats, butterfishes					
49.	*Scatophagus argus* (Linnaeus)*	Spotted butterfish	Pita chandee Kura chandee	+	–	–
Suborder	: MUGILOIDEI					
Family	: MUGILIDAE—mullets					
50.	*Liza parsia* (Hamilton-Buchanan)*	Goldspot mullet	Meji, Mejia	+	+	+
51.	*Mugil cephalus* Linnaeus	Flathead grey mullet	Khainga, Kabala	+	+	+
52.	*Valamugil seheli* (Forsskal)*	Bluespot grey mullet	Megi	+	–	–
53.	*Valamugil speigleri* (Bleeker)	Speigler's grey mullet	Meji, Chanara	+	–	–
Suborder	: POLYNEMOIDEI					
Family	: CALLIONYMIDAE—dragonet					
54.	*Callionymus sagitta* Pallas	Arrowheaded dragonet		+	–	–
Family	: ELEOTRIDAE—sleepers, gudgeons					
55.	*Butis melanostigma* (Bleeker)	Gudgeon	Gagi-balakhera	–	+	–
56.	*Eleotris fusca* (Bloch & Schneider)	Brown gudgeon	Bundi, Balakhera	–	+	+

57. *Ophiocara porocephalus* (Valenciennes)	Porocephalus gudgeon	Gagi-balakhera	–	+	–
Suborder : GOBIOIDEI					
Family : GOBIIDAE—gobies					
Subfamily : GOBIINAE					
58. *Chiramenu fluviatilis* Rao	Rao's goby	Gola	–	+	+
59. *Glossogobius biocellatus* (Valenciennes)	Twospot goby	Neuli	+	+	+
60. *Glossogobius giuris giuris* (Hamilton-Buchanan)*	Bareyed goby	Bali-garada, Gola,	+	–	+
61. *Oxyurichthys microlepis* (Bleeker)	Smallscaled goby	Gula	+	+	+
Family : GOBIOIDIDAE—eellike gobies					
Subfamily : TRYPAUCHENINAE					
62. *Trypauchen vagina* (Bloch & Schneider)	Burrowing goby	Pania, Aunda	–	+	–
Suborder : ACANTHUROIDEI					
Family : SIGANIDAE—rabbit fishes, spinefoot					
63. *Siganus canaliculatus* (Park)	Whitespotted spinefoot	Worahmah	+	–	–
Suborder : CHANNOIDEI					
Family : CHANNIDAE—snakeheads					
64. *Channa punctatus* (Bloch)*	Green snake-head	Godissa	–	–	+
Family : MASTACEMBELIDAE—spiny eels					
65. *Mastacembelus pancalus* (Hamilton-Buchanan)	Spiny eel	Baira, Turibahru	–	–	+
Order : PLEURONECTIFORMES					
Suborder : PLEURONECTOIDEI					
Family : BOTHIDAE—lefteye flounders					
66. *Pseudorhombus arsius* (Hamilton-Buchanan)	Largetoothed flounder	Potpotia	–	+	–
Suborder : SOLEODEI					
Family : CYNOGLOSSIDAE—tongue soles					

67.	*Cynoglossus cynoglossus* (Hamilton-Buchanan)	Bengal tongue sole	Kukurjivo	—	—	+
68.	*Cynoglossus semifasciatus* Day	Indian tongue sole	Kukurjivo	+	+	+
Order : TETRAODONTIFORMES						
Suborder : BALISTOIDEI						
Family : BALISTIDAE —triggerfishes						
69.	*Abalistes stellatus* (Lacepede)	Starry triggerfish	Ratijalka	—	+	-
Suborder : TETRAODONTOIDEI						
Family : TETRAODONTIDAE—puffers, blowfishes						
70.	*Chelonodon patoca* (Hamilton-Buchanan)	Gangetic blowfish	Bengaphulla	+	+	-

SUMMARY

Fish fauna of the Rushikulya estuary (29 species), Gopalpur creek (38 species) and Bahuda estuary (39 species) of Ganjam district in South Orissa is listed. A total of 70 species belonging to 12 orders, 14 sub-orders, 39 families, 8 sub-families and 52 genera have been recorded. Majority of the fish fauna in these waters are of marine origin as most of the species are also recorded along the adjoining Ganjam coast. Clupeids, bagrids, ariids and mugilids are the most common groups contributing substantially to the local fisheries.

ACKNOWLEDGEMENT

The authors are grateful to Dr. A. K. Ghosh, Director, Zoological Survey of India, Calcutta for facilities and keen interest in the studies. This paper was finalised here on Scientist's pool Scheme, CSIR, New Delhi of 1st author.

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Rec. Zool. Surv. India, 94 (1) : 113-117, 1994

A NEW SPECIES OF A LITTLE KNOWN GENUS OF PTEROMALIDAE (HYMENOPTERA : CHALCIDOIDEA) FROM INDIA

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INTRODUCTION

The genus *Oniticellobia* was erected by Boucek in 1976 with *Oniticellobia sublaevis* Boucek as type species from South Africa. The specimens were reared from the brood balls of *Oniticellus formosus* Chevrolat (Coleoptera: Scarabaeidae). He also described another species *O. reticulata* Boucek from the same region. Later Prinsloo (1980) reported one female of the species *O. reticulata* Boucek reared from the brood balls of *Oniticellus* sp. collected from Port St. Jhons Tanskei (S. Africa). This genus is practically unknown from the Oriental region except Boucek et al. (1978) reported an indetermined species from India (Karnataka) and Sri Lanka. A new species *O. longigastra* is described here from Kerala, India.

Oniticellobia longigastra sp. nov.
(Figs. 1-7)

Holotype : Female : Length 4·4 mm. Body blackish metallic green almost black on dorsal side; gaster black. Antenna with scape, pedicel and anelli testaceous, remainder dark brown; club blackish. Eyes dark cupreous. Legs with coxae concolorous with thorax, remainder reddish testaceous; tarsi paler with tips brown. Tegulae brown; wings hyaline; veins brown.

Head: (Fig. 4) 1·2X as broad as mesoscutum; 2·3X as broad as long in dorsal view and 1·1X as broad as high in front view; temples 0·65X as long as the eye; POL 1·5X OOL; ocelli moderate. Head finely reticulate, more coarsely on the scrobal area, sides of it with interconnected striae diverging downwards; lower margin

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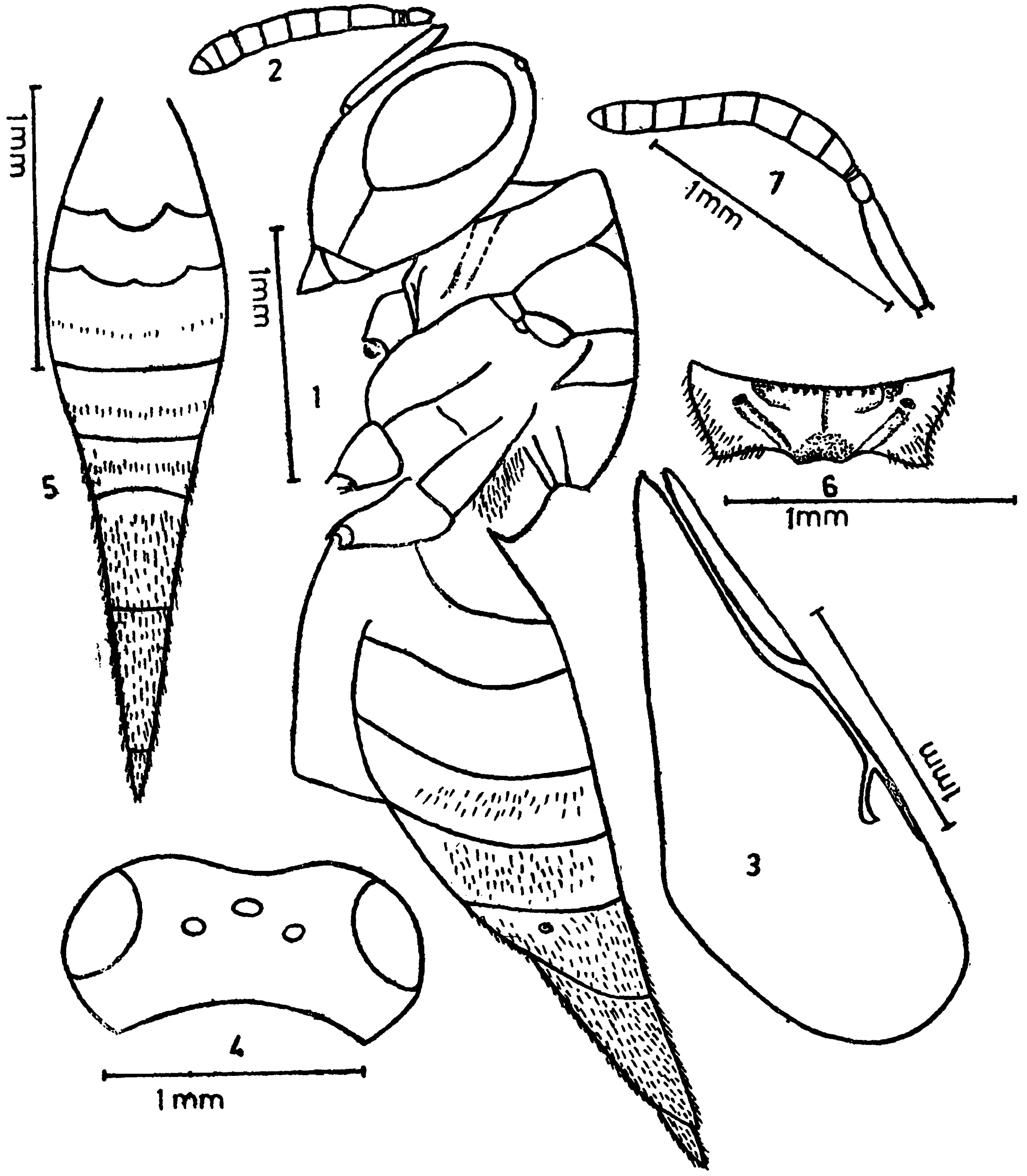

Figs. 1-7. *Oniticellobia longigastra*, sp. nov., female : 1, habitus ; 2, antenna ; 3, fore wing ; 4, head in dorsal view ; 5, gaster in dorsal view ; 6, propodeum ; 7, male antenna,

of clypeus with two distinct teeth, radiately striated, striae extending beneath the eyes and malar space; malar grooves distinct. Antenna (Fig. 2) inserted distinctly above lower margin of eyes; scape reaching just below lower margin of median ocellus; combined lengths of pedicel and anelli equal to F1; third anellus as long as first and second combined; F1 elongate; F2 slightly shorter; F3, F4 and F5 equal; club three jointed, sutures oblique, slightly longer than two preceeding segments combined.

Thorax: Uniformly reticulate, coarser on hinder part of mesoscutum and scutellum; pronotum 2·9X as broad as long, lateral panel of collar with sinuate oblique furrow; mesoscutum 2X as broad as long, notaular grooves broad, shallow and almost complete; scutellum 1·1X as broad as long, without frenum; dorsellum with very minute reticulation; propodeum (Fig. 6) 3X as broad as long, finally reticulate; nucha short and convex; median carina distinct, reaching up to nuchal base; costula weak; plicae indicated only by an anterior swelling mesad of spiracle; spiracle moderate, oval, followed by post-spiracular groove; callus with less dense pubescence; lateral corners of propodeum sharp; prepectus not depressed, rather small and lobe like, microreticulate; mesopleuron strongly raised reticulate, except for a shiny triangular area beneath the wings; metapleuron similarly reticulate as mesopleuron; legs normal, hind femur 3·8X as long as broad; tibiae slender, mid tibia 8·8X as long as broad; hind tibia 6·5X as long as broad. Forewing (Fig. 3) basally bare, pubescence otherwise short. Relative measurements of sm, m, pm, and st as 26 : 13 : 5·9 : 5·5.

Gaster: (Figs. 1 & 5) 1·4X longer than head plus thorax combined, sharply acuminate apically; T1 with hind margin distinctly angulate; T2 subangulate, with hind margin slightly incised at middle; basal half of T4 pubescent laterally; T5 completely pubescent laterally; T6 and epipygium completely pubescent; epipygium 2·5X as long as broad; hypopygium reaching hind margin of T4.

Male: Length 2-2·5 mm. Similar to female but differing as follows: Antenna (Fig. 7) with two anelli equal in length and six funicle segments; scape just reaching front ocellus and F1 shorter than F2. Gaster more ovate with pubescence sparse on terminal tergites.

Biology: Unknown. Lot of specimens were collected from a cocount plantation with bottom covered by fodder grass of hybrid variety, Nappier-B 21 (Hybrid Nappier) from the campus of Central Plantation Crops Research Institute, Kayamkulam, Kerala.

Holotype: Female, INDIA: Kerala: Kayamkulam CPCRI campus, 19.ii.1989, Coll. P. M. Sureshan. ***Allotype***: Male, Same data as that of holotype; ***Paratypes***:

12 ♀ ♀ 6♂♂, data same as that of holotype ; 34 ♀ ♀, 4 ♂ ♂ (in alcohol) 20.ii.1989, other data same as that of holotype ; 1 ♀, INDIA : Kerala : Ranni, 24.xi.1988, Coll. P. M. Sureshan ; 1 ♀, Ernakulam, 9.ii.1989, Coll. P. M. Sureshan ; 1 ♀, Calicut University Campus, 26.x.1986, Coll. P. M. Sureshan ; 1 ♀ Calicut University Campus, vii.1986, Coll. Narendran & Party ; 1 ♀, Parambikulam, 22.xii.1985, Coll. Narendran & Party ; 3 ♀ ♀, Calicut University Campus, 1982, Coll. Mohandas.

Remarks : This species closely resembles *O. reticulata* Boucek, but differs in having antenna (Fig. 2) with third anellus as long as first and second combined, ocelli moderate, median from lateral by 1·5X its maximum diameter, POL 1·5X OOL, thorax with uniform fine engraved reticulation, which is not obliterated, making surface finer in an arch on the highest convexities of mesoscutum, and epipygium (Fig. 5) 2·5X as long as broad. *O. reticulata* has the antenna with third anellus longer than first and second combined, ocelli large, median from lateral by hardly more than its maximum diameter ; POL slightly greater than OOL, thorax with reticulation slightly obliterated, making surface finer in an arch on the highest convexities of mesoscutum and epipygium about twice as long as broad.

Key to the species of *Oniticellobia* Boucek

1. Thorax shiny, reticulation very weak on mesoscutum (and vertex) mainly engraved, alutaceous ; gaster in female hardly longer than head plus thorax, more fusiform ; epipygium only slightly longer than broad at its base ; pedicel in female about 2·4X as long as broad and much longer than F1. South Africa ... *O. sublaevis* Boucek.

— Thorax dull, distinctly raised reticulate ; gaster in female much longer than head plus thorax, narrow, conical posteriorly ; epipygium 2-2·5X as long as broad ; pedicel in female 1·8-2X as long as broad and shorter than F1. 2

2. Antenna with third anellus longer than first and second combined ; POL slightly greater than OOL ; Ocelli large, median from lateral by hardly more than its maximum diameter ; epipygium about twice as long as broad. South Africa, South West Africa and Ethiopia ... *O. reticulata* Boucek.

— Antenna (Fig. 2) with third anellus as long as first and second combined ; POL 1·5X OOL ; Ocelli moderate, median from lateral by 1·5X of its maximum diameter ; epipygium (Fig. 5) 2·5X as long as broad. India : Kerala. ... *O. longigastra*, sp. nov.

ACKNOWLEDGEMENT

The first author is grateful to the Director, Zoological Survey of India, Calcutta and the Officer-in-Charge, Zoological Survey of India, Western Ghat Regional Station, Calicut for providing facilities. The authors are also grateful to the Head of the Department, Department of Zoology, University of Calicut for providing necessary facilities.

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Rec. zool. Surv. India, 94 (1) : 119-143, 1994

MAMMALS OF UTTAR PRADESH TERAI

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INTRODUCTION

The Zoological Survey of India under the U. P. Survey programme, extensively surveyed the U. P. Terai region between 1983 and 1990. The author participated in these surveys particularly for the mammalian fauna of the region. It has been increasingly felt that a thorough knowledge of the mammalian species occurring in the Terai region is a prerequisite or any study from research and management point of view and for their survival and propagation in the region. As mammals constitute the central complex of wildlife ecosystem, their knowledge in the area is important for sound wildlife conservation measures, tourism promotion and in the programme of preparation of faunal inventory. In the present paper, an attempt has been made to compile an up to date list of mammals of U. P. Terai districts based on field observation and from the published records.

The Terai (=moist land) also known as "Duars" in West Bengal and Bangladesh, is a strip of formerly marshy land stretching parallel to the lower ranges of the Himalayas in Northern India. It extends roughly from Yamuna river in the west to the Brahmaputra river in the east. A large portion of it lies within Nepal (Anon., 1973). In U. P., the Terai region is situated in the northern part of the State and spreads in ten districts bordering Nepal. These districts are parts of Nainital, Pilibhit, Lakhimpur-kheri, Bahraich, Gonda, Basti, Sidhartnagar, Maharajganj, Gorakhpur and Deoria. The U. P. Terai region is bounded in the north by Nepal, west by parts of Nainital, Rampur and Bareilly districts, south side by the districts of Sahjahanpur, Sitapur, Lucknow, Barabanki, Faizabad, Azamgarh and Ballia and in the east by the State of Bihar. The total area of 10 districts of U. P. Terai is about 51,147 sq. km. At the northern edge of the U. P. Terai, where the riverless forest tract of the Bhabhar (coarse gravel deposits) ends, a series of springs emerge out which unitedly form numerous streams that intersect the Terai and are responsible for its marshy character. The topography is more or less flat, interspersed with a large number of rivers of varying size. Important among these are the Sharda, Gomti, Ghaghra, Rapti, Rohin, Sarayu and Aami. The luxurious tropical dry-deciduous forests comprise mainly of sal, and also mixed forests abound the U. P. Terai, particularly in the northern side.

In the past, because of the inaccessable nature of the terrain due to poor communication link, poverty, excess of mosquitoes and mosquito born diseases, contaminated water, etc., the wildlife remained more or less undisturbed from human interference. But in recent past, the human population has increased manifold. To accommodate the growth, overall development took place which has witnessed expansion of human activities, particularly expansion of agriculture and setting up of new human colonies. These constraints forced a number of species to receed in number. This regression is attributed to the shrinkage of natural habitat, deforestation, increased rate of poaching and expansion of agricultural fields right up to the edge of the forest. Loss of wasteland along the periphery of the forest, which acts as buffer zone to both the wildlife and the cattle, unrestricted grazing and spreading urbanisation are some more parameters which affected the regression.

The U. P. Terai is one of the richest area for the typical large mammals of northern India. The elephant, the sambar, the barking deer, the chital, the hog deer, the wild boar all abound in this area. The tiger, the leopard, the wolf, the wild dog, etc., are the predators, and the hyaena, the jackal and the Bengal fox scavenging on the remains of the predator-kill.

In the present paper, 58 species of mammals belonging to 10 orders, 19 families and 44 genera are being recorded.

SYSTEMATIC ACCOUNT

Order : INSECTIVORA

Family : SORICIDAE

1. **Suncus murinus** (Linnaeus)

House shrew

1766. *Sorex murinus* Linnaeus, *Syst. Nat.* 12th ed. 1 : 44.

Type locality : Java.

Distribution : Throughout temperate and tropical regions of Europe, Africa, North America and Asia. This is the commonest shrew in India and is found throughout the Indian subcontinent.

Status in U. P. Terai : Very common. Seen moving in the camps at Pilibhit, Lakhimpur-Kheri, Bahraich, Basti and Gorakhpur districts by the author during early night. Also reported from Bahraich district (Lal, 1977), and Gorakhpur and Maharajganj districts (Singh, 1976 ; Ahsan, 1983).

2. S. **etruscus** (Savi)
Savi's Pygmy Shrew

1822. *Sorex etruscus* Savi, *Nuovo Giorn. de Letterati, Pisa,* 1 : 60.

Type locality ; Pisa, Italy.

Distribution : Southern Europe ; eastern and southern Africa, Middle East and Sri Lanka. In India, it is widely distributed in Peninsula up to Punjab in the north, Sikkim, West Bengal and Assam in the east and Orissa in the south.

Status in U. P Terai : Not very common. One specimen was recorded from the house in the thickly populated area of Gorakhpur by the author at night.

Order : CHIROPTERA
Family : PTEROPODIDAE

3. **Rousettus leschenaulti** (Desmarest)
Fulvus Fruit Bat

1820. *Pteropus leschenaulti* Desmarest, *Encycl. Meth. Mamm.* 1 : 110.

Type locality : Pondicherry, India.

Distribution ; Nepal, Bhutan. Duars, Myanmar, Indo-China, Southern China and Java. In India, the species is distributed in Peninsular India including the Western Ghats, Bombay, Coorg, etc.

Status in U. P. Terai : Fairly common and can be seen in the orchards in the late evening and nights. The Fulvus Fruit Bat has been recorded from Gorakhpur and Mahrajganj districts (Singh, 1976 ; Ahsan, 1983).

4. **Pteropus giganteus** (Brünnich)
Indian Flying Fox

1782. *Vespertilio gigantea* Brünnich, *Dyrenes Historie.* 1 : 45.

Type locality ; Bengal, India.

Distribution : Widely distributed in Peninsular India northward to Rajasthan, Gujarat, Punjab, western and eastern Himalayas. The species has also been distributed in Sri Lanka, Nepal, Bhutan and Myanmar.

Status in U. P. Terai : Very common. The author recorded this species from their roosting place (an old tree) in Sahebganj vegetable market in Gorakhpur. It is also recorded from Bahraich district (Lal, 1977).

5. **Cynopterus sphinx** (Vahl)
Short-nosed Fruit Bat

1797. *Vespertilio sphinx* Vahl, *Skr. Nat. Selsk Copenhagen*, 4, 1 : 123.

Type locality : Tranquebar, Madras, India.

Distribution : Hainan, Vietnam, Bhutan Duars, South-East Asia, Sri Lanka. In India, the species is widely distributed in the Peninsula and U. P. Terai regions.

Status in U. P. Terai : The species is commonly found damaging the fruit crops in the orchard at dusk and night. Also reported from Bahraich (Lal, 1977).

Family : MEGADERMATIDAE

6. **Megaderma lyra** Geoffroy
Indian False Vampire

1810. *Magaderma lyra* Geoffroy, *Ann. Mus. H.N. Paris*, 15 : 190.

Type locality : Madras, India.

Distribution : Southern China, Shan States, Myanmar, Malay States and Sri Lanka. In India, the species is widely distributed from Kashmir to Cape Camorin and from Western Ghats to Bhutan Duars.

Status in U. P. Terai : Common. Found in caves, pits, crevices of old houses and hollows of trees. The species has been recorded from the five districts of Terai region i.e. Bahraich, Gonda, Basti, Gorakhpur and Deoria (Sinha, 1985).

Family : VESPERTILIONIDAE

7. **Myotis formosus** (Hodgson)
Hodgson's Bat

1835. *Vespertilinio formosa* Hodgson, *J. Asiat. Soc. Bengal,* 4 : 700.

Type locality : Nepal.

Distribution : Nepal, Southern China, Korea, Formosa and Southern Japan. The Hodgson's Bat has been reported from Punjab, Kumaon (U. P.), Sikkim, Assam and West Bengal in India.

Status in U. P. Terai : Commonly found in all the districts by the author.

8. **Pipistrellus coromandra** (Gray)
Indian Pipistrelle

1838. *Scotophilus coromandra* Gray, *Mag. Zool.* Bot. 2 : 498.

Type locality : Pondicherry, India.

Distribution : Southern China, Hainan, Laos, Vietnam, Peninsula of India, Sri Lanka.

Status in U. P Terai : The species is very common in the wasteland and peripheral jungles where caves, rocks and crevicies are present. Being early flier with jerking erratic flight, the species has been recorded from all the districts by the author. Lal (1977) has also recorded the Indian Pipistrelle from Bahraich district.

9. **P. mimus** Wroughton
Indian Pygmy Pipistrelle

1899. *Pipistrellus mimus* Wroughton, *J. Bombay nat. Hist. Soc.,* 12 : 722.

Type locality : Surat, India.

Distribution : Practically the whole of India, Sri Lanka, Myanmar, east to Vietnam.

Status in U. P. Terai : Recorded from the roof hole at the Railway Officer's Inspection Bungalow at Basti.

10. **Scotophilus heathi** (Horsfield)
Greater Yellow Bat

1831. *Nycticejus heathi* Horsfield, *Proc. Zool. Soc.* : 113.

Type locality : Madras, India.

Distribution : China and its adjoining south-eastern parts, Myanmar, Bhutan, and Sri Lanka. The species is found throughout India.

Status in U. P. Terai : A common species in the area and the author has recorded it from Lakhimpur, Bahraich, Gonda and Deoria districts. The Greater Yellow Bat has also been reeorded earlier from Bharaich (Lal, 1977) and from Gonda (Gupta, 1977).

Order :. PRIMATES
Family : CERCOPITHECIDAE

11. **Macaca mulatta** (Zimmermann)
Rhesus Macaque

1780. *Cercopithecus mulatta* Zimmermann, *Geogr. Gesch. Mensch.* 2 : 195.

Type locality : India.

Distribution : Afganistan, Nepal, Myanmar, east to Vietnam, Southern China and Tibet. Widely distributed in Northern India including Himalayas where the species is found up to 2340 m altitude.

Status in U. P. Terai : Very common and has been recorded from all the ten districts of U. P. Terai by the author. Sharma (1964) has recorded the specics from Lakhimpur-Kheri, Lal (1977) from Bahraich, Gupta (1977) from Gonda and Singh (1976) and Ahsan (1983) have recorded from Gorakhpur and Mahrajganj districts.

12. **Presbytis entellus** (Duffresne)
Hanuman Langur

1797. *Simia entellus* Duffresne, *Bull. Soc. Philom. Paris*, (1) 7 : 49.

Type locality : Bengal, India.

Distribution : Practically the whole of India, except the western deserts the eastern limit being Tista river in West Bengal. Also Sri Lanka and southern Tibet.

Status in U. P. Terai : Common. Recorded from all the ten districts of the region by the author. The species has also been recorded by Sharma (1964), Lal (1977), Gupta (1977) and Singh (1976) from Lakhimpur-Kheri, Bahraich, Gonda, Gorakhpur and Mahrajganj districts respectively. Ahsan (1983) has also reported its occurrence from Gorakhpur and Maharajganj districts.

Order : PHOLIDOTA

Family : MANIDAE

13. **Manis crassicaudata** (Gray)

Indian Pangolin

1827. *Manis crassicaudatus* Gray, in *Griffith's Cuvier Anim. Kingd.*, 5 : 282.

Type locality : India.

Distribution : Sri Lanka and throughout the Indian Peninsula.

Status in U. P. Terai : Because of its nocturnal habits, :the species though common, seldom comes under notice. The Indian Pangolin has been reported from Bahraich (Lal, 1977) and from Gonda (Gupta, 1977).

Order : CARNIVORA

Family : CANIDAE

14. **Canis lupus** Linnaeus

Wolf

1758. *Canis lupus* Linnaeus, *Syst. Nat. 10th ed.*, 1 : 39.

Type locality : Sweden.

Distribution : North America, Europe, Commonwealth of States (Former USSR), Northern Greece, Turkey, Asia and practically whole of India.

Status in U. P. Terai : Not common. The species has been recorded from Lakhimpur-Kheri (Sharma, 1964), Bahraich (Lal, 1977) and from Gonda (Sharma, 1964 ; Gupta, 1977).

15. **Canis aureus** Linnaeus
Asiatic Jackal

1758. *Canis aureus* Linnaeus, *Syst. Nat. 10th ed.*, 1 : 40.

Type locality : Province of Lar, Iran.

Distribution : South-eastern Europe, South-western Asia, throughout India, Nepal, Sri Lanka extending a little into Myanmar and South-eastern Thailand.

Status in U. P. Terai : Commonly found in every district of the area in wasteland, scrub forest and forest edges. The species has also been reported from Lakhimpur-Kheri and Gonda (Sharma, 1964), Bahraich (Lal, 1977), and Gorakhpur and Mahrajganj districts (Singh, 1976).

16. **Vulpes Bengalensis** (Shaw)
Bengal Fox

1800. *Cuon bengalensis* Shaw, *Gen. Zool.* (1) 2 : 330.

Type locality : Bengal, India.

Distribution : Whole of India and Nepal.

Status in U. P. Terai : Commonly found in every district of the U. P. Terai, in burrows in the wasteland and cultivated fields. The species was also recorded from Lakhimpur-Kheri (Sharma, 1964), from Bahraich (Lal, 1977), from Gonda (Sharma, 1964), from Gorakhpur and Mahrajganj (Singh, 1976 and Ahsan, 1983).

17. **Cuon alpinus** (Pallas)
Indian Wild Dog, Dhole, Red Dog

1811. *Canis alpinus* Pallas, *Zoogr. Ross Asiat.* 1 : 34.

Type locality : Udskoi Ostrog, Amurland.

Distribution : Central and eastern Asia from the Altai mountain and Manchuria, southward through the forest regions of India to the Malay countries.

Status in U. P. Terai;: Occasional visitor. The species has been reported to occur in **Bahraich** district (Lal, 1977) and Gonda district (Gupta, 1977).

Family : URSIDAE

18. **Melursus ursinus** (Shaw)
Sloth Bear

1791. *Bradypus ursinus* **Shaw,** *Nat. Misc.* **2 (unpaged), pls. 58-59.**

Type locality : Patna, Bihar, India.

Distribution : From base of the Himalayas to southern Peninsula, and Sri Lanka, in forest patches.

Status in U. P. Terai ; The Sloth Bear has been seen in Kishanpur forest adjoining the Dudhwa National Park, Lakhimpur-Kheri district. Lal (1977) has reported the occurrence of this species in Bahraich, Sharma (1964) and Gupta (1977) in Gonda district.

Family : MUSTELIDAE

19. **Mellivora capensis** (Schreber)
Ratel or Honey Badger

1776. *Viverra capensis* **Schreber,** *Saugeth.* **pl. 125, also 1777. 3 : 450, 583.**

Type locality : Cape of Good Hope.

Distribution : Africa, Western Asia, east to Nepal. In India, the species has been recorded from north western and western India east to West Bengal and south to Madras.

Status in U. P. Terai : The species has been recorded in the forest at night at Dudhwa National Park. Lal (1977) and Gupta (1977) have also recorded it from forests of Bahraich and Gonda districts.

20. **Lutra perspicillata** Geoffroy
Smooth coated Indian Otter

1826. *Lutra perspicillata* **Geoffroy,** *Dict. Class. H.N.* **9 : 519.**

Type locality : Sumatra.

Distribution : Sumatra, Malay States, Laos, Vietnam, Western Yunnan, Myanmar, Assam, Nepal Terrai, Sind and southwards to Travancore.

Status in U. P. Terai : A pair of smooth coated Indian Otter has been seen in the river Suheli by the author in an afternoon drive. Also reported its occurrence in the Dudhwa National Park (Anon., n.d.).

Family : VIVERRIDAE

21. **Viverricula indica** (Desmarest)

Rasse, or Small Indian Civet

1817. *Viverra indica* Desmarest, *Nouv. Dict. N.H.* 7 : 170.

Type locality : India.

Distribtion : Southern China, further to south-eastern Asia, Bhutan, Myanmar and throughout India, except Himalayas.

Status in U. P. Terai : Common. A lone specimen was seen at early night at P.W.D. Inspection Bungalow at Gonda by the author. The species has also been reported from Gorakhpur and Mahrajganj districts (Singh, 1976 ; Ahsan, 1983).

22. **Paradoxurus hermophroditus** (Pallas)

Common Palm Civet, or Toddy Cat

1777. *Viverra hermophroditus* Pallas, In Schreber, *Sangeth.* 3 : 426.

Type locality : India.

Distribution : Widely distributed in South-Eastern Asia and Sri Lanka. In India, the species is recorded in Himalayas from Kashmir to Assam and southwards through whole of the Peninsula.

Status in U. P. Terai : Common. One specimen each has been observed at the camp at Pilibhit and Bhinga in Bahraich district by the author. Ahsan (1983) has also reported its occurrence in Gorakhpur and Maharajganj districts.

23. **Herpestes aurpunctatus** (Hodgson)
Small Indian Mongoose

1836. *Mangusta auropunctata* Hodgson, *J. Asiat. Soc. Bengal,* 5 : 235.

Type locality : Nepal.

Distribution : Western Asia, Myanmar and Malay countries. In India, the species is found from Jammu & Kashmir to West Bengal, Orissa and Assam.

Status in U. P. Terai : Common and can be seen in wasteland and bushes in all the districts of the U. P. Terai region. Lal (1977) and Gupta (1977) have reported this species from Bahraich and Gonda districts respectively.

24. **H. edwardsi** (Geoffroy)
Indian Gray Mongoose

1818. *Ichneumon edwardsii* Geoffroy, *Deser. Egypte,* 2 : 139.

Type locality : Madras, India.

Distribution : Western Asia, Pakistan, Nepal, Sri Lanka and throughout India except the Himalaya.

Status in U. P. Terai : Common and has been recorded from all the ten districts of U. P. Terai by the author. The species has also been recorded from Bahraich (Lal, 1977), Gonda (Gupta, 1977), Gorakhpur (Singh, 1976 ; Ahsan, 1983) and Mahrajganj (Singh, 1976).

Family : HYAENIDAE

25. **Hyaena hyaena** (Linnaeus)
Striped Hyaena

1758. *Canis hyaena* Linnaeus, *Syst. Nat. 10th. ed.* 1 : 40.

Tppe locality ; Laristan, Southern Iran.

Distribution : Southern Russia, south-western Asia Minor, northern Africa, Nepal (Terai) and throughout India.

Status in U. P. Terai : Hyaena has been recorded in the forests of Bhinga in Bahraich district and in the Dudhwa National Park by the author. The species has also been recorded from Bahraich (Lal, 1977), Gonda (Gupta, 1977) Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983).

Family : FELIDAE

26. **Felis chaus** Guldenstaedt

Jungle Cat

1776. *Felis chaus* Guldenstaedt, *Nov. Com. Acad. Petrop.*, 20 : 483.

Type locality : Terek river, north of Caucasus.

Distribution : Widely distributed from Egypt to Tibet and through India to Vietnam, also Sri Lanka.

Status in U. P. Terai : Widely distributed in the U. P. Terai region and has been recorded from Nainital, Pilibhit, Lakhimpur-Kheri, Basti and Deoria districts by the author. The species has also been reported to occur in Bahraich (Lal, 1977), Gonda (Gupta, 1977), Gorakhpur (Singh, 1976 ; Ahsan, 1983) and Mahrajganj, (Singh, 1976 ; Ahsan, 1983).

27. F. **mormorata** Martin

Marbled Cat

1837. *Felis marmorata* Martin, *Proc. Zool. Soc.*, 1836 : 108.

Type locality : Sumatra.

Distribution : Nepal, Sikkim, Assam, northern Myanmar, east to Vietnam, Malay States, Sumatra and Borneo.

Status in U. P. Terai : One specimen was seen at dusk in Bhinga forest in Bahraich district. The species has also been reported from Gorakhpur and Mahrajganj districts (Singh, 1976).

28. **F. bengalensis** Kerr
Leopard Cat

1792. *Felis bengalensis* Kerr, *Anim. Kingd.*: 151.

Type locality : Bengal, India.

Distribution : Siberia, South-eastern Asia generally northwards to Manchuria and Korea. In India, the species is found in forest regions from the Himalaya to Cape Camorin.

Status in U. P Terai : The species has been recorded from Dudhwa National Park in an evening trekking near Suheli river. Lal (1977) has reported the occurrence from Bahraich and Singh (1976) from Gorakhpur and Mahrajganj districts.

29. **F. viverrina** Benett
Fishing Cat

1833. *Felis viverrina* Bennett, *Proc. Zool. Soc.*,: 68.

Type locality : Malabar coast, India.

Distribution : India, Sri Lanka, Nepal, east to Vietnam and South to Sumatra, Java and Bali. In India, reported from West Bengal, Orissa and Kerala.

Status in U. P. Terai : Rarely seen. Reported to occur in Bahraich district (Lal, 1977).

30. **Panthera pardus** (Linnaeus)
Leopard

1758. *Felis pardus* Linnaeus, *Syst. Nat. 10th ed.*, 1 : 41.

Type locality : Egypt.

Distribution : Widely distributed in Russia, Asia Minor, parts of African continent Western Asia, China, Tibet, east to Vietnam, Malaysia, whole of India and Sri Lanka.

Status in U. P Terai : Common. Evidence of the presence of this species has been gathered in all the ten districts. Anon (n. d) reported the presence in Dudhwa

National Park, Lakhimpur-Kheri district. The presence of Leopard has also been reported from Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, (1977), Gorakhpur and Mahrajganj districts (Singh, 1976).

31. **P. tigris** (Linnaeus)

Tiger

1758. *Felis tigris* Linnaeus, *Syst. Nat. 10th ed.*, 1 : 41.

Type locality ; Bengal, India.

Distribution ; Widely distributed in parts of Russia and China, Iran, most parts of India except the desert zone, Myanmar, Vietnam, Malaysian States, Sumatra, Java and Bali.

Status in U. P. Terai : Inhabit suitable pockets in the region with maximum concentration in Dudhwa National Park and Kishanpur Wild Life Sanctuary in Lakhimpur-Kheri district. The species has also been recorded in Corbett National Park, Nainital district. It also occurs in Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, 1977), Gorakhpur (Singh, 1976, Ahsan, 1983) and Maharajganj (Singh, 1976 ; Ahsan, 1983).

Order : PROBOSCIDEA

Family : ELEPHANTIDAE

32. **Elephas maximus** Linnaeus

Indian Elephant

1758. *Elephas maximus* Linnaeus, *Syst. Nat. 10th ed.*, 1 : 33.

Type locality ; Sri Lanka.

Distribution : Sri Lanka, Myanmar, Thailand, Malay States, Sumatra and in India, along the base of Himalayas from Dehradun to Assam and between Ganges and Krishna, Western Ghats and Mysore.

Status in U. P Terai : Elephant inhabits Corbett and Dudhwa National Parks in Nainital and Lakhimpur-Kheri districts respectively. The species has also been seen in the forests of Gorakhpur district where the forest is contiguous with that of Nepal (Singh 1976, Ahsan 1983).

Order : ARTIODACTYLA

Family : SUIDAE

33. **Sus scrofa** Linnaeus
Wild Boar

1758. *Sus scrofa* Linnaeus, *Syst. Nat., 10th ed.*, 1 : 49.

Type locality : Germany.

Distribution : Widely distributed throughout the world.

Status in U. P. Terai : Common in all the districts of U. P. Terai. The species has been reported from Nainital (Lamba, 1987), Lakhimpur-Kheri (Anon, n. d), Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983).

34. **S. salvanius** (Hodgson)
Pygmy Hog

1847. *Porcula salvania* Hodgson, *J, Asiat. Soc. Bengal*, 16 : 423, pls. 12, 13.

Type locality : Sikkim, India.

Distribution : Terai between Bhutan and northern Assam, particularly in Manas Biosphere Reserve.

Status in U. P. Terai : It used to be fairly common about a century ago but now disappeared from the area due to habitat modification (Mukherjee 1966).

Family : CERRIDAE

35. **Muntiacus muntjac** (Zimmermann)
Barking Deer

1780. *Cervus muntjak* Zimmermann, *Geogr. Gesch.*, 2 : 131.

Type locality : Java.

Distribution : Nepal, India, Sri Lanka, southern China, Thailand, Vietnam, Borneo and Lombok.

Status in U. P. Terai : Commonly found in whole of U. P. Terai region. The species has also been reported from Nainital (Lamba, 1987), Lakhimpur-Kheri (Anon, n. d ; Sharma, 1964), Bahraich (Lal, 1977), Gonda (Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983).

36. **Axis axis** (Erxleben)
Chital or Spotted Deer

1777. *Cervus axis* Erxleben, *Syst. Regn. Anim.*, : 312.

Type locality : Bank of Ganges, India.

Distribution : Nepal, Sri Lanka and practically whole of India up to an elevation of about 1,000 meters.

Status in U. P. Terai : Plenty in all the suitable pockets. The species is also reported by Lamba (1987) from Nainital, Anon (n. d) ; from Lakhimpur-Kheri, Lal (1977) from Bahraich, Gupta (1977) ; from Gonda, Singh (1976) and Ahsan (1983) from Gorakhpur and Mahrajganj districts.

37. **A. porcinus** (Zimmermann)
Hog Deer

1780. *Cervus porcinus* Zimmermann, *Geogr. Gesch.*, 2 : 131.

Type locality : Bengal, India.

Distribution : Low alluvial grass plains in northern India extending into Myanmar, east to Vietnam and S. China. Introduced in Sri Lanka.

Status in U. P. Terai : Widely distributed in U. P. Terai region but their number is certainly less than Chital. The species has also been reported from Nainital, Lakhimpur-Kheri, Bahraich, Gonda, Gorakhpur and Mahrajganj (Lamba, 1987 ; Anon, n.d ; Sharma, 1964 ; Lal, 1977 ; Gupta, 1977, Singh, 1976 ; Ahsan, 1983).

38. **Cervus unicolor** (Kerr)
Sambar

1792. *Cervus axis unicolor* Kerr, *Anim. Kingd.* : 300.

Type locality : Sri Lanka.

Distribution : Sri lanka, India, Myanmar, China, Taiwan, Celebes Is., Thailand, Vietnam, Sumatra, Borneo and the Philippines.

Status in U. P Terai : Widely distributed in suitable pockets throughout U. P. Terai. The species has been recorded from Nainital (Lamba, 1987), Lakhimpur-Kheri (Anon, n.d; Sharma, 1964), Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983).

39. C. **duvauceli** Cuvier
Swamp Deer, Barasingha

1823. *Cervus duvauceli* Cuvier, *Oss. Foss. ed.* 2, 4 : 505.

Type locality : North India.

Distribution : India, north of the Ganga from Kumaon to Assam, and south of the Ganga principally in Madhya Pradesh.

Status in U. P. Terai : Confined to Dudhwa National Park and Kishanpur Wildlife Sanctuary in Lakhimpur-Kheri district. Lal (1977) has reported Swamp Deer from Bahraich but its occurrence now is doubtful there.

Family : BOVIDAE

40. **Tetraceros quadricornis** (Blainville)
Four-horned Antelope, Chausingha

1816. *Cerophorus (Cervicapra) quadricornis* Blainville, *Bull. Soc. Philom,* Paris, : 75-76.

Type locality : Plains of Peninsular India.

Distribution : Peninsular India to Nepal Terai.

Status in U. P. Terai : Rare. Reported from Bahraich district by Lal (1977).

41. **Boselaphus tragocamelus** (Pallas)
Nilgai, Blue Bull

1766. *Antilope tragocamelus* Pallas, *Misc. zool.*,: 5.

Type locality : Plains of Peninsular India.

Distribution : Base of Himalaya to Karnataka in the south.

Status in U. P. Terai : Common and becomes menace to the agriculture crop in the area. The species has been reported from the area by Lamba (1987), Anon (n. d), Lal (1977), Sharma (1964), Singh (1976) and Ahsan (1983).

42. **Antilope cervicapra** (Linnaeus)
Blackbuck

1758. *Capra cervicapra* Linnaeus, *Syst. Nat. 10th ed.*, 1: 69.

Type locality : Trivendram, India.

Distribution : India from Punjab, east to West Bengal and south to Cape Camorin.

Status in U. P. Terai : Rare. The species has been reported from Bahraich (Lal, 1977) and Gonda (Sharma, 1976 ; Gupta, 1977) districts only.

Order : LAGOMORPHA
Family : LEPORIDAE

43. **Lepus nigricolis** Cuvier
Indian Black-naped Hare

1823. *Lepus nigricollis* Cuvier, *Dict. Sci. Nat.*, 26 : 307.

Type locality : Tamil Nadu, India.

Distribution : Practically whole of India. Pakistan, Nepal, Bhutan, Myanmar, Java and Sri Lanka.

Status in U. P. Terai : Common and distributed throughout U. P. Terai. The species has been reported from Nainital (Lamba, 1987), Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983).

44. **Caprolagus hispidus** Pearson
Hispid Hare

1839. *Lepus hispidus* Pearson, in McClelland, *Proc. zool. Soc.*, 152.

Type locality : Northern Assam, Foot of Himalaya, India.

Distribution : North-eastern India, West Bengal, Assam, west to Uttar Pradesh and Nepal.

Status in U. P. Terai : Rare. Recently located in Dudhwa National Park, Lakhimpur-Kheri district by Sinha (1990).

Order : RODENTIA

Family : SCIURIDAE

45. **Petaurista petaurista** (Pallas)
Common Giant Flying Squirrel

1766. *Sciurus petaurista* Pallas, *Misc. zool.*, : 54.

Type locality : Western Java.

Distribution : Malay States, Thailand, Vietnam, China, Myanmar and Nepal. In India, the species is distributed in Jammu & Kashmir, Himachal Pradesh and Peninsular India.

Status in U. P. Terai : Two specimens were seen gliding from one tree to the other in PWD Inspection Bungalow at Pilibhit at dusk. A group of about four specimens were also noticed in Dudhwa National Park in Lakhimpur-Kheri district by the author.

46. **Funambulus pennanti** Wroughton
Northern Palm Squirrel

1905. *Funambulus pennanti* Wroughton, *J. Bombay nat. Hist. Soc.*, 16 (3) : 411.

Type locality : Surat, India.

Distribution : Pakistan, Nepal and throughout northern India.

Status in U. P Terai : Common and found practically in all the districts of U. P. Terai. Lamba (1987) and Lal (1977) have reported it from Nainital and Bahraich respectively.

Family : HYSTRICIDAE

47. **Hystrix indica** (Kerr)

Indian Crested Porcupine

1792. *Hystrix cristata* var. *indica* Kerr, *Anim. Kingd.* : 213.

Type locality : India.

Distribution : Western Asia, southern Arabia, parts of Turkestan, Transcaucasia, Sri Lanka, Nepal and widely distributed in India.

Status in U. P. Terai : Widely distributed in U. P. Terai districts. One specimen each was seen in Dudhwa National Park, Lakhimpur-Kheri and Pilibhit district at dusk. The species has also been reported from Nainital (Lamba, 1987), Bahraich (Lal, 1977), Gonda (Sharma, 1964 ; Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983) districts.

Family : MURIDAE

48. **Vandeleuria oleracea** (Bennett)

Indian Long-tailed Tree Mouse

1832. *Mus oleraceus* Bennett, *Proc. zool. Soc.* : 121.

Type locality : Deccan, India.

Distribution : Sri Lanka, Nepal, Myanmar, east to Vietnam, S. China and throughout India.

Status in U. P. Terai : Thomas (1914) reported its occurrence in Ramnagar, Nainital district.

49. **Millardia meltada** (Gray)
Soft-furred Field Rat

1837. *Golunda meltada* Gray, *Mag. Nat. Hist.*, **1 :** 586.

Type locality : Dharwar, India.

Distribution : Peninsular India, north to Punjab and Uttar Pradesh, also Sri Lanka and Nepal Tarai.

Status in U. P. Terai : The species has been recorded from wasteland near agriculture fields in Deoria and Gorakhpur districts (Sinha, 1985).

50. **Rattus rattus** (Linnaeus)
House Rat

1758. *Mus rattus* Linnaeus, *Syst. Nat. 10th ed.*, **1** : 61.

Type locality : Sweden.

Distribution : Widely distributed throughout the world including India.

Status in U. P. Terai : Common in almost every household in the U. P. Terai. The species has been recorded from Nainital (Lamba, 1987), Bahraich (Lal, 1977), Gonda (Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976). Sinha (1985) has recorded it from Bahraich, Gonda, Basti, Gorakhpur and Deoria districts.

51. **Mus musculus** Linnaeus
House Mouse

1758. *Mus musculus* Linnaeus, *Syst. Nat. 10th ed.*, **1 :** 62.

Type locality : Sweden.

Distribution : Distributed throughout the world including India.

Status in U. P. Terai : Widely distributed. The species has been recorded from Nainital (Lamba, 1987), Bahraich (Lal, 1977), Gonda (Gupta, 1977), Gorakhpur and Mahrajganj (Singh, 1976 ; Ahsan, 1983). Sinha (1985) has recorded it from Bahraich, Gonda, Basti, Gorakhpur and Deoria districts.

52. **Mus booduga** (Gray)
Little Indian Field Mouse

1837. *Leggada booduga* Gray, *Charlesworths Mag. Nat. Hist.*, 1 : 586.

Type locality : Southern Maharashtra, India.

Distribution : Northern and Peninsular India, western and eastern Ghats, Kumaon and Punjab extending up to mid Myanmar.

Status in U. P. Terai : Common. The species has been recorded from Nainital, Bahraich, Gorakhpur and Mahrajganj districts by Lamba (1987), Lal (1977), Singh (1976) and Ahsan (1983), respectively.

53. **Golunda ellioti** Gray
Indian Bush Rat

1837. *Golunda ellioti* Gray, *Charlesworths Mag. Nat. Hist.*, 1 : 586.

Type locality : Dharwar, India.

Distribution : Sri Lanka, Indian Peninsula, north up to Punjab. The range extends into Pakistan, Nepal and Bhutan.

Status in U. P. Terai : Common in western part of U. P. Terai. Lamba (1987) and Lal (1977) have recorded the species from Nainital and Bahraich districts respectively.

54. **Bandicota bengalensis** (Gray and Hardwicke)
Lesser Bandicoot Rat, Indian Mole Rat

1833. *Arvicola bengalensis* Gray & Hardwicke, *Illus. Indian Zool* : 2, pl. 21.

Type locality : Bengal, India.

Distribution : South-eastern Asia including whole of India.

Status in U. P. Terai : The presence is noticed by the mole hills they made at their place of habitation. Lal (1977) has recorded the species from Bahraich. Sinha (1985) has also reported it from Bahraich, Gonda, Basti, Gorakhpur and Deoria districts.

55. **Bandicota indica** (Bechstein)
Large Bandicoot Rat

1800. *Mus indicus* Bechstein, *Ueber Vierf. Thiere.*, 2 : 497.

Type locality : Pondicherry, India.

Distribution : Widely distributed in India and adjoining countries including Sri Lanka, Nepal, Myanmar, east to Vietnam, S. China, Java, Sumatra and Hong Kong.

Status in U. P. Terai : Common. The species has been recorded by Sinha (1985) from Bahraich, Gonda, Basti, Gorakhpur and Deoria districts. Lamba (1987), Singh (1976) and Ahsan (1983) have also recorded from Nainital, Gorakhpur, Mahrajganj districts respectively.

56. **Nesokia indica** Gray & Hardwicke
Short-tailed Bandicoot Rat, Short-tailed Mole Rat

1832. *Arvicola indica* Gray & Hardwicke, *Illust. Ind. Zool.*, 1, pl. XI.

Type locality : India.

Distribution : Southern Russia, Chinese Turkestan, western Asia. In India, it occurs from Jammu & Kashmir to West Bengal.

Status in U. P. Terai : The species has only been recorded from Nainital district by Lamba (1987).

57. **Tatera indica** (Hardwicke)
Indian Gerbil, Antelope Rat

1807. *Dipus Indicus* Hardwicke, *Trans. Linn. Soc.* London, 8 : 279.

Type locality : Between Varanasi and Hardwar, India.

Distribution : Western Asia, Sri Lanka, Nepal Terai and widely distributed in Indian Peninsula and Punjab.

Status in U. P. Terai : Common. Lamba (1987) has recorded it from Nainital and Sinha (1985) has recorded it from Bahraich, Gonda, Basti, Gorakhpur and Deoria districts.

Order : CETACEA

Family : PLATANISTIDAE

58. **Platanista gangetica** (Lebeck)

Gangetic Dolphin, Susu

1801. *Dolphinus gangeticus* Lebeck, *Neue, Schr. Ges. Naturf. Fr.* Berlin, 3 : 280.

Type locality : Hooghly river near Calcutta, India.

Distribution : In India, the species has been recorded from river Ganga and Brahmaputra and their tributaries.

Status in U. P. Terai : The species has been recorded from Ghagra river in Bahraich district (Lal, 1977).

SUMMARY

An inventory of the fauna occurring in Terai region of Uttar Pradesh has been attempted. The Terai is spread in ten districts of U. P. *viz.*, parts of Nainital, Pilibhit, Lakhimpur-Kheri, Bahraich, Gonda, Basti, Sidharthnagar, Gorakhpur, Mahrajganj and Deoria, with an approximate area of 51,147 sq. km. As mammals constitute the central complex of wildlife, their knowledge in the area is important for sound wildlife conservation measures and tourism promotion. The account records 58 species of mammals belonging to 10 orders, 19 families and 44 genera.

ACKNOWLEDGEMENTS

Thanks are due to the Director, Zoological Survey of India for assigning the problem. The author is thankful to the Officer-in-Charge, Northern Regional Station, Zoological Survey of India for providing necessary facilities, encouragements and help in various ways during the course of study. Thanks are also due to Dr. G. S. Arora, Scientist SE, NRS, ZSI, Dehradun for kindly going through the manuscript and suggestions.

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